

JPRS 78466

8 July 1981

USSR Report

CHEMISTRY

No. 75



FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

Soviet books and journal articles displaying a copyright notice are reproduced and sold by NTIS with permission of the copyright agency of the Soviet Union. Permission for further reproduction must be obtained from copyright owner.

8 July 1981

USSR REPORT

CHEMISTRY

No. 75

CONTENTS

ADSORPTION PHENOMENA

- Selection of an Optimal Biochemical Reactor for Microbiological Synthesis 1
- Pore Structure of Charcoal Adsorbents and Their Adsorption Capacities for Gases and Vapors. Part 4. Features in the Dynamics of the Adsorption of Highly Volatile Compounds 2
- Kinetics of Adsorption by Sorbents Having a Bimodal Distribution of Pore Sizes, Based on the Osmotic Adsorption Isotherm. Part I. Case When the Rate-Limiting Step Is the Mass Transport in the Carrier Pores 2
- Limiting Stage Method in the Dynamics of Sorption Processes. Part I. Areas of Influence of Internal and Longitudinal Diffusion in the Case of Dynamics Limited by External Diffusional Kinetics 3

AEROSOLS

- Motion of Anisotropic Aerosol Particles in a Gas Medium Nonuniform with Respect to Temperature 4

ANALYTICAL CHEMISTRY

- Determination of Pesticides in Air, Concentration of Vapors of Pesticides by Means of Ethylene Glycol 5
- Calorimetric Analysis of the Phase State of Silicone Rubber 6
- Extraction-Photometric Determination of Toxic Aromatic Hydroxy Compounds in Water 6

Group Concentration of Trace Pesticides in Water Analysis	7
Determination of Low Phosphorus Quantities by the Formation of Molybdophosphoric Blue in an Aqueous Acetone Medium.....	8
Determination of Urea-Based Herbicides by Acid-Base Spectrophoto- metric Titration	8

BIOCHEMISTRY

Biosynthesis of Anabasis Aphylla Alkaloids	10
N-(Beta-Acetoxyethyl)Morpholine Iodomethylate as a Specific Acetylcholinesterase Substrate	11
Synthesis of Anorexogenic Peptide	11
Nitropolycarboxylic Quinones as Stimulants for Malting and Enzymatic Hydrolysis	12
Effect of pH on Hydrolysis of Various Substrates by Cholinesterase ...	13

CHEMICAL INDUSTRY

The Chemical Industry: Needs and Resources	14
Orientation Toward the Finished Product	16
Progress Report on Assemblers in the Chemical Industry	19
Construction of Togliatti Nitrogen Plant	21
Progress Report on Construction of Projects for the Production of Fertilizers	22
Progress in Petrochemical Plant Construction	24
Polypropylene Production in Siberia	26
Achievements in the Chemical Industry	28
New Plastics Plant Started Up in Kuma River Region	31
Briefs	33

Energy Crisis and Changes in the Structure of the Chemical Industry	41
Current Goals for the Growth of the Chemical Industry	42
Problems in the Growth of Petrochemical Complexes	43
Problems in Increasing the Level of Branch Planning and Production Efficiency	43
Problems in the Economic Efficiency of the USSR Chemical Industry	44
Scientific and Technical Progress and Energy Resources in the Chemical Industry	45
Problems in the Formulation of Long-Term Predictions for the Growth of the Petrochemical Industry	45
Interrelation of Long-Term Planning and Prediction with the Use of Optimization Calculations in the Chemical Industry	46
Problems in Planning Scientific Investigations in the Chemical Industry	47
Current State and Prospects for Increasing the Utilization of Resources in the Chemical Industry	47
Growth of Foreign Economic Relations of the Chemical Industry	48

COAL GASIFICATION

Production of Ammonia and Methanol from Coal	49
Theoretical Bases and Prospects for Coal Gasification	50
Technical and Economic Basis for Developing New Methods of Deep Processing of Coals	51
Coal Hydrogenization Using Moderate Hydrogen Pressure Methods	51
Investigation of Products of Low-Temperature Catalytic Hydrogenization of Donbas Coals	52
Recovery Depolymerization of Coal	52
Production of Synthetic Gas from Coal	53

Plasma Coal Gasification	54
Structure and Molecular Interactions in Coal and Their Influence on Conversion Processes	55

ELECTROCHEMISTRY

Investigation of a High Temperature Fuel Element	56
--	----

FERTILIZERS

Apparatus for Granulation of Mineral Fertilizers in a Pseudo-Fluidized Bed Using an Electrostatic Field	57
Optimization of Control of the Synthesis Gas Preparation Section of the AM-600 Ammonia Production Plant	58
Study of the Cooling Process of Circulating Gas in the Evaporator of Absorption-Type Cooling Units of a Large- Unit-Capacity Ammonia Synthesis Plant	59
Quality Control of Liquid Ammonia for Export	61

FUELS

Current State of the Art of the Problem of Methanol Synthesis (Methanol As an Energy Carrier and Chemical Raw Material)	62
Results of the All-Union Conference on the Chemistry and Technology of Synthetic Fuels	63
Prospects for Developing the Production of Synthetic Fuels in the USSR and Abroad	63
Economic Problems of Fuel Production in Thermic Processing of Baltic Combustible Shales	64
Economic Production Indicators and the Effectiveness of Using Synthetic Fuels Produced from Coal	64
Economic Conditions for the Development of Synthetic Fuel Production from Coal in a Long-Range Perspective	65
Prospects and Technical and Economic Evaluation of Methods for Obtaining Synthetic Liquid Fuel from Coal	65

Premises for the Selection of the Optimal Structure for a Plan for Separating Liquid Products of the Chemical Processing of Solid Fuels	66
Thermal Dissolving of Combustible Shales and Coals	66
Low-Temperature Hydrogenation and Conversion of Combustible Shales as Methods for Investigating Their Structure and Obtaining Liquid Products	67
A Comprehensive System for Processing Sulphurous Mazut	67
Kinetic Characteristics of the Pyrolysis of Heavy Crude Oil	68
Hydrodesulphurization of Petroleum Residues with Preliminary Hydrodemetallization	68
Production, Distribution and Use of Synthetic Gas and Environmental Problems	69
Expansion of Energy Resources in the USSR	69
Technical and Economic Indicators of Hydrocarbon Synthesis from Carbon Monoxide and Steam	70
Problems and Prospects of Using Emulsified Fuel	70
Antioxidants for Hydrogenated Jet Fuels	71
Synthesis of Aliphatic Hydrocarbons from Carbon Monoxide and Hydrogen on Cobalt-Calcium Aluminate Catalysts	71
Structure and Properties of Iron Catalysts in Carbon Monoxide Hydration Processes	72
Co-MgO-Alumosilicate and Zeolite Catalysts for Synthesizing Aliphatic Hydrocarbons from CO and H ₂	73
Synthesis of Aliphatic Hydrocarbons from Oxides of Carbon and Hydrogen on Complex Catalyst	74
Development of Production Technology of Methanol and Higher Alcohols for Fuel and Energy Purposes	74
Synthetic Solid Fuel Production from Kansk-Achinskii Coal	75

Some Principles of Thermal Decomposition of Shale in Solid Heat Transfer Reactors and Possibilities of Technological Forecasting....	76
Ecological Engineering Problems of Synthetic Fuel Production from Coal and Training of Specialists for This Field	76
Comprehensive Utilization of Peat--National Wealth of the Land	77
Suitability Assessment of Coal for Synthetic Fuel Production	78
Group Structure Characteristics of High-Boiling Fractions of Liquid Pyrolysis Products of Shale Gasoline	79
Possible Methods and Perspectives of Generating Photocatalytic Conversions of Solar Energy	79

ORGANOMETALLIC COMPOUNDS

Methods of Preparation and Properties of Phenylarsonous Acid Aminoethers	81
Phosphonium and Arsonium Derivatives of the Iodopentacarbonyls of the VI Group Metals	82
Synthesis of (p-Tolyl)Alkylarsine Dichlorides and Their Reactions	82
Synthesis of Some Methyl-di(p-Halophenyl)Alkyl(Aryl) Arsoniums and Their Properties	83

ORGANOPHOSPHORUS COMPOUNDS

Isomerization of S-2-Oxyalkyl Esters of Cyclic Thioacids of Phosphorus	84
Synthesis of ω -Substituted Butene Esters of Phosphorus Thioacids	84
Structure of the Product of the Reaction of Hexaethyltriaminophosphine with Carbon Bisulfide, Additional Coordination of the Phosphorus Atom by Three Sulfur Atoms	85
Investigation of the Interaction of Cyclic and Acyclic Phosphorus and Carbon Derivatives with Solvents	86
Synthesis, Structure and Transformations of Esters of α -Ketophosphonic Acids	87

Phosphorylation of 1-Substituted Aziridines by Acid Chlorides of Acids of Phosphorus	87
Tris(2,2,2-Trichloroethoxy)Aminochlorophosphoranes and Tetra(2,2,2- Trichloroethoxy)Aminophosphoranes	88
Phosphorylation of N-Trimethylsilyl- and N-Chloro-1-Cyano- 2,2,2-Trichloroethanimines	89
Synthesis and Properties of Δ^4 -1,3,2-Oxazaphospholines. III	90
Reactions of Chloral and Isothiocyanates with α -Amino Phosphonates and the Structure of Phosphorylated Thiourea	91
Triaryl(Isocyanatomethyl)Phosphonium Iodides	92
Reactions of Complete Esters of Acids of Trivalent Phosphorus with 1-Nitro-3,3,3-Trichloro-1-Propene	93
Reaction of β -Keto Alcohols with Acid Chlorides of Thiophosphonous Acids in the Absence of Organic Bases	94
Reaction of Carbon Tetrachloride with Esters of Ethylphosphonous Acid	95
Structure of Phosphoranes with Trichloromethyl Substituents from Data of ^{31}P NMR and ^{35}Cl NQR Spectra	95
Reactions of Phosphorus-Containing Polysulfides with Diazo Compounds, Reaction of Bis(Dialkoxothiophosphoryl)Tri- and Tetrasulfides with Diazomethane.....	96
Synthesis of Dialkylphosphonoethinylcyclohexenes 2,2-Dimethyl- 4-Dialkylphosphonoethinyl- Δ^4 -Dihydropyrans, 2,2-Dimethyl-4- Dialkylphosphonoethinyl- Δ^4 -Dihydrothiopyrans and 1,2,5- Trimethyl-4-Dialkylphosphonoethinyl- Δ^4 -Dehydropiperidines.....	97
Some Hexaalkyltriaminophosphonium ylides	98
Interaction of Thiourea with Hexaalkyltriaminophosphonium Salts	99
Reactions of (2,2-Dichloro-1-Acylaminovinyl)Triphenylphosphonium Chlorides with Nucleophilic Reactants	100
Reaction of 1-Bromadamantane with Tripropyl Phosphite	101

Reactions of Chlorodicyanoethylenes with Trialkyl Phosphites and Triphenyl Phosphine	101
Oxyarylalkylamidophosphites	102
Interaction of Phosphorus Pentachloride with Diallyl Acetal	103
Reaction of Triethyl Phosphite with Isonitrosoacetone	103
Reaction of 2,2'-Dicyclohexanonylsulfide with Phosphine	104
Synthesis of Some Phosphorus-Containing Di- and Tetrahydropyrans	105
Hydrogen Isotope Exchange of Benzenechromodicarbonyldiphenyl- ferrocenylphosphine in Both Acidic and Basic Environments	105
Study of the Interaction of Diorganophosphinic Acids with Tris((Organosiloxydihydroxy)-Substituted Metals	106
Mechanism of the Perkovic Reaction.....	107
Exchange Reactions in a Series of P(III) Derivatives. Features of the Exchange in a Series of Phosphonous Derivatives	108
Study of the Rotational Isomers of O,O-Dimethyl-S- Trimethylsilyldithiophosphate	108
The Reaction of Phosphorous Acid Esters with Phosphonous Trihalides..	109
Reaction of 1,3,2-Oxaza- and Diazaphospholanes with Hydrogen Sulfide	110
Irregular Permutational Isomerization of Spiro-1,2- Oxaphosphol-4-Enes	111
Reaction of Perfluoroidoalkanes with Esters of Phosphorous Acids ...	111
Reaction of Alkyl Halides with Ethylphosphonous Acid Esters	112
Reaction of ω -Haloacylphosphonous Salts with Amines	113
Synthesis and Study of the Phosphonium Salts of Chloromethyl- β -Chlorovinylketone and Triphenylphosphine	114

Synthesis of O-Butyl-S-Methylbenzylidithiophosphonate Containing Radioactive Tracers P-32 and C-14	114
Dipole Moments of Bonds of Aryl-Substituted Phosphorus and Arsenic.....	115
Production and Extraction of Tributylphosphine	116
Reactions of Dialkylamidodithiophosphite with Dithiophosphoric Acids...	117
Monoxides of Unsymmetric Amidoalkoxydiphosphines and Their Isomeric Mixed Anhydrides, Phosphorotropic Tautomerism	117
Phosphorylation of the Iminoanalogues of α -Halocarbonyl Compounds. 2. Communication. Reaction of Substituted Haloacetic Acid Amidines with Trialkylphosphites	118
Phosphorylation of the Imino Analogues of α -Halocarbonyl Compounds. 3. Communication. Reaction of Amidines of Haloacetic Acids with Trialkylphosphines and Hexaalkyltriamidophosphites	119
Stereodynamic Characteristic of N'-Diethoxyphosphoryl- and N-Triphenylphosphonium-N ¹ ,N ² -Dimethylamidine.....	119
Alkylation Products of the Reaction of Phosphorus Diiodide with Alkyl Iodides and Their Structures	120
Phosphorylated Adamantanes. 1 Communication. Phosphorylation of 1- and 2-Hydroxyadamantane with Trivalent Phosphorus Acid Chlorides.....	121
Reactivity of Sulfuryl Chloride in Reactions with 1,2- Alkadienephosphonates	121
Phosphorus Containing Crowns. 2. Communication, Dibenzomethylphosphonyl-20-Crown-7.....	122
Reactions of Phosphorus Containing Tri- and Tetrasulfides. Reaction of Bis(Dialkoxyphosphoryl- and -Thiophosphoryl)Tri- and -Tetrasulfides with Primary Amines	122
Catalytic Reaction of Aryldiazonium Borofluorides and Sulfates with Divinyl and Isoprene in the Presence of Potassium O,O- Dialkyl(Aryl)Dithiophosphates.....	123
Addition of Cyclophosphorous Acids to Unsaturated Compounds.....	123

Exchange Reaction of Substituents at P ^{III} Atom with the Participation of Acetoxy and Amide Groups.....	124
Addition of Sulfuryl Chloride to the P=O Bond	124
Reaction of Adamantanone with Phosphorus Trichloride	125
Synthesis of β -Bromoalkylphosphonic Acid	125
N, N-Bis(Trimethylsilyl)Amide of N'-(1-Adamantyl)-Imidophosphenous Acid	126
Oxidative Phosphorylation of Propargyl Halides	126
Reaction of Bis(Dialkoxyphosphoryl)Disulfides with Diazomethane. A Novel Rearrangement in a Series of Phosphorus Containing Derivatives of Disulfides	127
Synthesis of Dialcoxy- and Diphenoxyphosphorylalkylendithiophosphites by the Michaelis-Becker Reaction	127
Rearrangement in Acylation of Phosphorus Ketolides by Trifluoroacetic Anhydride	128
Kinetics of Alkaline Hydrolysis of Aminoalkylphosphonic Acid Esters...	128
Halogenation of π -Cyclopentadienyltricarbonyl Rhenium and π - Cyclopentadienyl(Triphenylphosphine)Dicarbonyl Rhenium	129
Substitution of the Cyanogroup in Phosphorus Cyanides	129
Reaction of Diethylcyanophosphite and Acetylacetone	130

PETROLEUM PROCESSING TECHNOLOGY

Visbreaking of Tar from a Mixture of West-Siberian Oil on a Thermal Cracking Unit	131
Oils with a Diester Base	131
Organoxycyclotriphosphazenes as Lubricating Oil Additives	132
Estimation of Products from the Hydrocracking of Normal Alkane Hydrocarbons	132
Breakdown of the Resinous Components of Petroleum of Various Chemical Types during Ozonolysis	133

Composition of Saturated Hydrocarbons of Fractions 150-175°C.....	134
Conversion of Hydrocarbons with Steam in the Presence of Alumophenium Catalysts	134
n-Octane Aromatization on a Polymetal Catalyst	135
Skeletal Isomerization of Pentene-1 on Applied Nickel Sulfate	135
Production of Phenylcyclohexane of Benzene Hydrodimerization on Nickel-Containing Zeolite Catalysts	136
Oxidative Methylation of Toluene by Alkanes C_1-C_4	136
Formation of Unsaturated Compounds in Cyclohexane Oxidation with Oxygen in the Air	137
Liquid-Phase Catalytic Oxidation of Trimethylbenzenes	137
Co-Oxidation of Coumene and Esters	138
Decomposition of Tetraline Hydroperoxide in the Presence of Complexes of Polyoxyethylene Complexes with $CoCl_2$	138
Composition of Reaction Products of Cyclohexane Oxide with Metaboric Acid	139
Liquid Phase Oxidative Ammonolysis of Alkylbenzenes	139
Conversion of Methanol on the Zeolite 'Ultrasil'	140
Effectiveness of Using Water-Fuel Emulsions in Medium-Speed Ship Diesels	140
Operating Characteristics of Internal Combustion Engine Operating on Water-Gasoline Emulsion	141
Addition of Water to Motor Fuels, One of the Directions for Expanding Their Resources and Conservation	141
Expanding Fuel Resources for Ship Gas Turbines	142
Scientific Bases for Expanding Diesel Fuel Resources and Conservation	142

Expanding the Resources and Conservation of Fuels in Gas Turbine Aviation Engines	143
Increasing the Economy of Internal Combustion Engines when Using Tetraethyl Lead as an Antiknock Additive	143
Conservation of Motor Vehicle Gasolines During Operation of Internal Combustion Engines	144
Expansion of Raw Material Resources in Gasoline Production	144
Collection and Use of Used Petroleum Products	145
Controlling Losses of Commercial Petroleum Products	145
Conservation of Fuel and Energy Resources in the Petroleum Refining and Petrochemical Industry	145
Conservation of Petroleum Products in the National Economy of the RSFSR	146
New Bacteriocidal Additives to Cutting Fluids	146
Esterification of Synthetic Fatty Acids of C ₅ -C ₉ Fraction by Polyoles	147
Production of Low-Congearing Diesel Fuel Using a Modified Reforming Catalyst	147
Optimum Temperature Conditions in Catalytic Reforming Reactors	148
Development of Hydro Cracking of Light Catalytic Cracking Gas Oil	148

POLYMERS AND POLYMERIZATION

Investigation of the Possibility of Modifying Polycapronamide Fibers by Adding Polyoxymethylene Admixtures	149
Reaction of 2-Acetyl-3-Methoxy-5-Methyldiazaphospholine with Phenylazide	150
Production of γ -Butyrolactone Based on Butene-2-Diol-1,4	151
Biostability of Plastics	151
Thermostability of Epoxide Coatings	152

RUBBER AND ELASTOMERS

Colloidal-Chemical and Technological Properties of Mixtures of Natural Latex and a Synthetic Aqueous Dispersion of Cis-1,4 Polyisoprene	153
Causes of Variation of the Efficiency of p-Nitrosodiphenylamine and Stabilizers of the p-Phenyldiamine Class in Filled SKI-3 Rubber	154
Determining the Density of the Vulcanization Network in Rubber Made from Combinations of SKI-3 and SKMS-30 ARK Rubber	154
Role of Calcium Hydroxide in Bisphenol Vulcanization of SKP-26 Rubber	155
Investigating Thermovulcanization of Polychloroprene by the Dielectric Method	156
Effect of Ultraviolet Radiation Intensity on the Rate of Creep of an Elastomer	156
Increasing the Intensifying Effect of Slag Ash Carbon Filler in Rubber	157
Fire-Hazard and Toxic Properties of Ingredients	157
Polybutadiene Urethane Materials for Wear-Resistant Coatings and Hermetic Products	158
Influence of Static Strains on Kinetics of the Oxidation of Vulcanized Rubber from Polyisoprene Containing Sulfur Bonds	158
Effect of Thickening Agents on the Properties of Food-Grade Latexes	160

ADSORPTION PHENOMENA

SELECTION OF AN OPTIMAL BIOCHEMICAL REACTOR FOR MICROBIOLOGICAL SYNTHESIS

Moscow KHIMICHESKAYA I NEFTYANOYE MASHINOSTROYENIYE in Russian No 12, Dec 80
pp 15-16

NIKOLAYEV, P. I. and SOKOLOV, D. P.

[Abstract] Hydrodynamic, mass transfer, kinetic and structural parameters of fermentors were analyzed to design an optimal fermentor. A typical fermentor was subdivided into three functional areas, characterized by dispersion of air and its mixing with circulating fluid (agitator), mass transfer between the gas phase and microbial suspension (reactor), and separation of used air (separator). Equations are given for microbial oxygen utilization rate, changes in microbial growth rate during transition from stationary to nonstationary conditions, and cell residence time in aerobic and anaerobic zones. Mathematical analysis showed that the volume of the unaerated separation zone may be increased during nonstationary microbial cultivation without a noticeable decrease in average cell growth rate. The capacity of microorganisms to adapt to nonstationary aeration maintains a satisfactory production level during relatively nonuniform aeration and agitation. Cultivation of Saccharomyces cerevisiae with intermittent aeration is presented as an example. Figures 3; references 4: 4 Russian.
[51-9307]

PORE STRUCTURE OF CHARCOAL ADSORBENTS AND THEIR ADSORPTION CAPACITIES FOR GASES AND VAPORS. PART 4. FEATURES IN THE DYNAMICS OF THE ADSORPTION OF HIGHLY VOLATILE COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 80 pp 1728-1731 manuscript received 17 Aug 79

DUBININ, M. M., NIKOLAYEV, K. M., POLYAKOV, N. S. and PIROZHKOV, G. L., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] Adsorption dynamics equations developed to describe adsorption experiments with low-volatility compounds were applied to the title study using C_2H_5Cl . The time necessary for the sorbent to develop a layer can be determined from the equation

$$t = \frac{a \cdot a}{C_0 \cdot v} \left[L - 2.3 \frac{v}{\beta_s} \lg C_0/C \right]$$

Three stages in the adsorption dynamics can be defined on a plot of time t in minutes versus the length L of penetration of the adsorbate into the absorbent layer. The first stationary stage is the almost instantaneous penetration a short distance (L_1) the second non-stationary stage also shows a non-linear rate of penetration with time and is transitional to the third or stationary stage for which the rate of penetration is constant with time. Values were calculated for the constants in the equation. The times calculated from this equation were within 10% of the experimental values. References 4: 4 Russian; Figures 2, Tables 2.

[56-12027]

KINETICS OF ADSORPTION BY SORBENTS HAVING A BIMODAL DISTRIBUTION OF PORE SIZES, BASED ON THE OSMOTIC ADSORPTION ISOTHERM. PART I. CASE WHEN THE RATE-LIMITING STEP IS THE MASS TRANSPORT IN THE CARRIER PORES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 80 pp 1722-1728 manuscript received 17 Jul 79

ZOLOTAREV, P. P. and UGROZOV, V. V., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] The title process is based on the following form of the asymptotic adsorption isotherm:

$$\frac{a}{a_0} = \frac{(1 + h)(c/c_0)^{1/2}}{h + (c/c_0)^{1/2}}$$

where the variables c_0 and a_0 represent the concentrations of the adsorbate vapors free in the pore space and immobilized on the surface respectively, g is the coefficient from the osmotic theory, and h is a parameter ranging from 0 to ∞ ; $h = 0$ corresponds to the limiting "right-angled" isotherm and $h = \infty$, to the Freynd-like isotherm. From this equation combined with the assumption that mass transport in the carrier pores is the rate-limiting step, rather precise approximate analytical solutions were obtained for the kinetics curves. Also determined were local concentration gradients of adsorbate on the charcoal particles, assuming that the latter had cylindrical shapes with impermeable lateral surfaces. Values for a_0 and c_0 ranged from 3.94 to 5.62 mmole/g and 1.37 to 3.28 mmol/cm³ $\times 10^3$ for three different types of charcoal. This theory is valid for interpreting the results of the adsorption of X-ray-contrasting material by charcoal and of most usual gravimetric kinetics experiments. References 14: 13 Russian, 1 Western; Figures 3; Tables 2.

[56-12027]

UDC 541.183:541.127

LIMITING STAGE METHOD IN THE DYNAMICS OF SORPTION PROCESSES. PART I. AREAS OF INFLUENCE OF INTERNAL AND LONGITUDINAL DIFFUSION IN THE CASE OF DYNAMICS LIMITED BY EXTERNAL DIFFUSIONAL KINETICS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 80 pp 1709-1713 manuscript received 28 Aug 79

VENITSIANOV, Ye. V., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadsky, USSR Academy of Sciences, Moscow

[Abstract] A simplified mathematical approach based on an asymptotic approach to the limiting stage is applied to the title process. This model is then used to calculate approximate solutions for multi-stage situations. The characteristic time and length parameters were calculated for internal, external, and longitudinal diffusion. Equations were developed for the condition that the external diffusion time is much longer than that for internal or longitudinal diffusions from which approximate solutions for the latter two processes were established. Other expressions established the relationship of the width of these zones to the sorption parameters. References 11: 9 Russian, 2 Western.

[56-12027]

AEROSOLS

UDC 541.182.21.3:532.51

MOTION OF ANISOTROPIC AEROSOL PARTICLES IN A GAS MEDIUM NONUNIFORM WITH RESPECT TO TEMPERATURE

Moscow KOLLOIDNYY ZHURNAL in Russian No 6, Nov-Dec 80 pp 1118-1122
manuscript received 31 Jul 79

REDCHITS, V. P. and GAYDUKOV, M. N., Kalinin University

[Abstract] Expressions were obtained by hydrodynamic analysis for thermophoretic motion of and forces acting on anisotropic ellipsoid particles in a gas medium with a temperature gradient. The analysis concentrated on the motion of an anisotropic spherical particle. The formulae were based on velocities of gas around the aerosol particle, temperature distribution within the gas and particle, and pressure distribution in the gas. In contrast to an isotropic spherical particle, the thermophoretic force acting on an anisotropic aerosol particle is not proportional to the temperature gradient but has a component that is perpendicular to it. References 17: 7 Russian, 10 Western.

[34-9307]

DETERMINATION OF PESTICIDES IN AIR, CONCENTRATION OF VAPORS OF PESTICIDES BY MEANS OF ETHYLENE GLYCOL

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 35, No 10, Oct 80 pp 2049-2051
manuscript received 19 Jan 79

CHMIL', V. D., All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev

[Abstract] A description and the results are given of an experimental study conducted for the purpose of determining the conditions for the preconcentration by means of ethylene glycol of vapors of pesticides and of products of their breakdown in the environment when making an analysis of the air. Compounds of various chemical natures and states of aggregation with various vapor pressures were selected for study, including 2,4-dichlorophenoxyacetic acid (2,4-D), the butyl ether of 2,4-D, 2,4-dichlorophenol (2,4-DKhF)--the product of the breakdown of 2,4-D and of the butyl ether of 2,4-D--and 4,4-dichlorodiphenyldichloroethylene (DDE)--the product of the breakdown of DDT. An electrical suction apparatus was employed to draw the air through a glass vessel whose bottom held the compounds studied and through four series-connected Zaytsev absorption devices containing ethylene glycol and described in an earlier study (1978). The vessel was placed in a water bath heated to a different temperature in order to form vapors. After the air was sampled the ethylene glycol was transferred by means of distilled water from each absorption device into a separating funnel, more distilled water was added and the compound to be analyzed was extracted by means of n-hexane. The hexane extract was dried by means of anhydrous sodium sulfate, the solvent was concentrated by evaporation and an analysis was made by the gas-liquid chromatography method. 2,4-D was identified in the form of methyl ether after methylation by means of dimethyl sulfate. Analysis of the content of pesticides absorbed by the ethylene glycol in each absorber revealed that in all cases 87 to 95 percent of the quantity of pesticides introduced was detected in the ethylene glycol of the first absorber. An estimate was made of the approximate concentration of vapors of pesticides in the air which can be determined by using this method of preconcentration. It is recommended that the air be passed through by means of an electrical suction apparatus, through two series-connected Zaytsev absorbers, each containing

10 ml of ethylene glycol with an admission rate of one to five liters per minute. Concentrations detected in the experiments conducted equaled 0.03 $\mu\text{g/l}$ of 2,4-DKHP, 0.03 $\mu\text{g/l}$ of the butyl ether of 2,4-D, 0.008 $\mu\text{g/l}$ of 2,4-D and 0.001 $\mu\text{g/l}$ of DDE. References 12: 5 Russian, 7 Western.
[20-8831]

UDC 543.73:678.84

CALORIMETRIC ANALYSIS OF THE PHASE STATE OF SILICONE RUBBER

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 5, Sep-Oct 80 pp 52-53
manuscript received 4 May 79

ALLAYAROV, S. R., KIRYUKHIN, D. P., ASAMOV, M. K. and BARKALOV, I. M.,
V. I. Lenin Tashkent State University

[Abstract] Phase states of rubber must be studied to determine the kinetics of low-temperature polymerization, which is useful in determining the value of silicone rubber. The phase states of polydimethylvinylsiloxane (SKTV-1), polydimethylmethylphenylmethylvinylsiloxane (SKTFV-803) and the low-molecular-weight polydimethylphenylsiloxane (SKTNF) were studied in the range of 77-270 K on a differential diathermic calorimeter. SKTV-1 crystallizes at ~ 160 K, melts at 228 K; its heat of crystallization is ~ 3 cal/g and heat of fusion ~ 5.4 cal/g. During melting of a rapidly cooled sample, glass comprises $\sim 55\%$ of the SKTV-1 polymer. SKTFV-803 devitrifies at 154 K and crystallizes at 179 K; its heat of crystallization is ~ 3.3 cal/g, heat of fusion ~ 3.5 cal/g, and melting point 207 K. During melting of a rapidly cooled sample, glass comprised 95% of the polymer. SKTV-1 and SKTFV-803 may be crystallized by slow cooling. SKTNF devitrifies at 158 K, does not crystallize even at 270 K, and becomes totally vitreous during cooling. Figures 4; references: 3 Russian.
[35-9307]

UDC 543:547.56

EXTRACTION-PHOTOMETRIC DETERMINATION OF TOXIC AROMATIC HYDROXY COMPOUNDS IN WATER

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 35, No 9, Sep 80 pp 1803-1806
manuscript received 26 Apr 79

KORENMAN, Ya. I., BORTNIKOVA, R. N., BOLOTOV, V. M., TALDYKINA, S. N.,
SEL'MANSHCHUK, N. N. and TISHCHENKO, Ye. M., Voronezh Technological Institute

[Abstract] A rapid (1 hr) and accurate method with the use of simple equipment was developed to determine phenol and its derivatives in water. The method was tested on purified waste water from phenol-producing plants not containing other aromatic

compounds and on water from the Oka River collected near Dzerzhinsk. The following conditions are recommended: 180 g of anhydrous Na_2SO_4 is added to 1 liter of water to be analyzed; this is acidified to pH 2 with HCl. Samples containing nitrophenols should be acidified to pH 0-0.5. An organic solvent with a distribution coefficient not below 30-40 (e.g., butyl acetate) is used to which 20 mol.% tributyl phosphate or camphor has been added. Under these conditions a 170-fold concentration is obtained. Further extraction with alkalinized aqueous solutions of the photometric reagent (*p*-nitroaniline or diazotized sulfanilic acid) produces an additional three-fold concentration. Test data on determining phenol in aqueous solutions containing sodium sulfate with the use of butyl acetate plus 20 mol.% tributyl phosphate showed a high degree of concentration (about 330) and the possibility of determining phenol in maximum allowable concentrations (about 0.001 mg/liter)

Tables 3; references 15: all Russian.

[45-9307]

UDC 543.3:543.544

GROUP CONCENTRATION OF TRACE PESTICIDES IN WATER ANALYSIS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 35, No 12, Dec 80 pp 2413-2417
manuscript received 2 Jan 80

CHMIL', V. D., All-Union Scientific Research Institute of Hygiene and Toxicology
of Pesticides, Polymers and Plastics, Kiev

[Abstract] Methods of determining trace amounts of the main classes of pesticides and their decomposition products (chlorinated hydrocarbons, chlorocarboxylic acid, chlorophenoxyalcanecarboxylic acid and chlorobenzoic acid, saturated phenylureas, phenols, nitrophenols, triazines, dipyrityls and derivatives of phosphoric, thiophosphoric, dithiophosphoric and phosphonic acids) were developed with their joint presence in water by concentration by means of a sequential combination of molecular and ionogenic absorption. Three methods of concentrating the trace pesticides were proposed as a function of their content in water. The chlorocarboxylic, chlorophenoxyalcanecarboxylic and chlorobenzoic acids changed to their corresponding salts and the phenols changed to phenolates after the acidity of the water sample has been brought up to pH of approximately 9-10. Separate determination of chloroorganic insecticides is possible with concentration by the second method. Phosphoroorganic insecticides can be determined individually by concentration by the third method. The various compounds are determined by gas-liquid and thin-layer chromatography and spectrophotometry and the pesticides can be concentrated from water by a factor of 100-200. Figures 1; references 10: 7 Russian, 3 Western.

[86-6521]

DETERMINATION OF LOW PHOSPHORUS QUANTITIES BY THE FORMATION OF MOLYBDOPHOSPHORIC BLUE IN AN AQUEOUS ACETONE MEDIUM

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian No 11, 1980 pp 2132-2136
manuscript received 6 Jun 79

PIUSHKINA, M. N., LEBEDEVA, L. I. and PETROKANSKAYA I. Yu.,
Leningrad State University imeni A. A. Zhdanov

[Abstract] Reduction of molybdophosphate (MP) by SnCl_2 was studied in aqueous organic media with acetone, ethanol, propanol and dimethylformamide. The molar extinction coefficients increased in the presence of ethanol and acetone, suggesting the feasibility of using aqueous acetone or ethanol solutions for determinations. Acetone produced a 20-fold increase in the concentration range in which reduced MP optical density remains stable; this indicated the greater reproducibility of results with acetone versus aqueous solutions. Optimal conditions for reduced MP determination were 40 vol.% acetone, $4 \cdot 10^{-4}$ M SnCl_2 and acidity of 0.5 M with use of HCl . Optical density should be measured within 15 min at 800 nm. Determination limit is 0.03 $\mu\text{g/ml}$ of P and standard deviation 0.009 $\mu\text{g/ml}$ for $n=8$, $P=0.95$. Silicon levels below 6 $\mu\text{g/ml}$ do not interfere in P determinations. This procedure is highly sensitive and reproducible and is being used to determine P in products (e.g., oil cake) of the oil and fat industry. Figures 4; tables 1; references 10: 8 Russian, 2 Western.
[36-9307]

DETERMINATION OF UREA-BASED HERBICIDES BY ACID-BASE SPECTROPHOTOMETRIC TITRATION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 35, No 9, Sep 80 pp 1793-1798
manuscript received 26 Apr 79

KARABUT, V. Ye. and SENETSKAYA, L. P., Moscow Chemical Engineering Institute
imeni D. I. Mendeleev

[Abstract] A spectrophotometric method was developed for acid-base titration of Cotoran (N-m-trifluoromethylphenyl-N',N'-dimethylurea) and its admixtures (N-m-trifluoromethylphenyl-N'-methylurea, TPMU, and N-m-trifluoromethylphenylurea, TPU), meturin (N-hydroxy-N-phenyl-N'-methylurea) and its admixtures (N-hydroxy-N-phenyl-N',N'-dimethylurea, HPDU, and N-hydroxy-N-phenylurea, HPU) and their technical-grade preparations without preliminary separation or hydrolytic cleavage. Solvents tested were anhydrous acetic and propionic acids, acetonitrile and a

combination of acetonitrile and chloroform. UV spectra were taken on an SF-4A spectrophotometer, which was also used for the titration. A $5 \cdot 10^{-3}$ M solution of chloric acid in acetic acid was the titrant. A 1:10 acetonitrile—chloroform mixture was optimal to differentiate TPU and its derivatives. HPU and its derivatives were titrated separately in acetonitrile or chloroform. Spectrophotometric curves for TPU and TPMU had one break and those for Cotoran, meturin, HPU and HPDU had two breaks. Combinations of Cotoran + TPMU, Cotoran + TPU and also their three-component mixture were analyzed. since they are found in commercial preparations and on environmental objects after herbicide application. The components in the two-component mixtures may be identified from their titration curve, if the TPU content is at least 0.50 mg or the TPMU content at least 0.45 mg in the titrated volume. Cotoran may be determined in a three-component mixture without preliminary separation. Acetonitrile and chloroform must be used to determine HPDU and meturin in a mixture. This spectrophotometric technique was used successfully to determine Cotoran in commercial products and waste water and meturin in commercial products. Tables 3; figures 3; references 7: 4 Russian, 3 Western.

[45-9307]

BIOSYNTHESIS OF ANABASIS APHYLLA ALKALOIDS

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, 1980 pp 56-60
manuscript received 6 Jul 79

ABDUSALAMOV, B. A., Tashkent Order of the Red Banner of Labor State University
imeni V. I. Lenin

[Abstract] Results are presented of a study of the dynamics of the accumulation of amino acids and alkaloids in *Anabasis aphylla* L. plants in the third year of vegetation over a 6 months period, from May through October. The purpose of the study was to examine the interrelationship between amino acid exchange and biosynthesis of alkaloids, as well as the possibility of the formation of the alkaloids aphylline and aphyllidine by oxidation of pachycarpine with the formation of a lactam group. Special attention was devoted to studying the change in the content of lysine and alkaloids at different periods of development of the plant. A definite relationship exists between the content of lysine and the biosynthesis of alkaloids, whereby lysine acts as a precursor of alkaloids. Fifteen free amino acids were identified, and a determination was made of the quantitative content of 11 of them. It was demonstrated that lysine is the precursor of aphylline and aphyllidine and that the last stage in the biosynthesis of these alkaloids involves the oxidation of pachycarpine and the formation of a lactam group. Direct experiments were carried out on fertilizing the plant with tagged pachycarpine and a study was made of the role of inclusion of the tag in aphylline and aphyllidine. C^{14} -tagged pachycarpine was prepared by lithium alumohydride reduction of C^{14} -aphylline separated from the plant after fertilizing it with 1.5- C^{14} -cadaverine. The radioactive pachycarpine was dissolved in water with the addition of citric acid. The preparation was divided into two portions and the plant was fertilized through the side roots and stalk. Records were made after three days of exposure and alkaloids were then separated by thin-layer chromatography. A mixture of aphylline and aphyllidine was separated and determination of the specific radioactivity of the alkaloids was determined. The yield of radioactive aphylline and aphyllidine from plants fertilized through the stalk is considerably less than from plants fertilized through the roots. This confirms the role of rootstocks in the biosynthesis of aphylline and aphyllidine. The radioactivity of alkaloids was determined with a BFL-25 gas flow radiation counter. References 15: 7 Russian, 8 Western.

[145-8831]

N-(BETA-ACETOXYETHYL)MORPHOLINE IODOMETHYLATE AS A SPECIFIC ACETYLCHOLINESTERASE SUBSTRATE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 5, Sep-Oct 80 pp 26-29
manuscript received 6 Feb 80

ABDUVAKHABOV, A. A., KASYMOV, Sh. K. and OTARGALIYEV, T. O., Institute of Bioorganic Chemistry, Uzbek Academy of Sciences

[Abstract] The effect of hydrophilizing the piperidine molecule (morpholine) on substrate properties for acetylcholinesterase (AChE) was studied. N-(Beta-acetoxyethyl)morpholine iodomethylate and -ethylate were synthesized as substrates for human erythrocyte AChE (EC 3.1.1.7) and equine serum butyrylcholinesterase (BuChE) (EC 3.1.1.8). Variation of pH did not induce morpholine derivative hydrolysis. Acetylcholine (ACh) was hydrolyzed 25 times more readily by BuChE than N-(beta-acetoxyethyl)morpholine methylate. Hydrolysis rate for the ethylate was 2.5-fold higher. Rate of methylate hydrolysis by AChE was 1.5-fold lower than ACh hydrolysis rate. The coefficient p and K_D [binding constant] were significantly lower in value during hydrolysis by BuChE than by AChE. The methylated morpholine derivative was slightly inferior to the piperidine derivative in AChE specificity but was more specific than the pyrrolidine and decahydroquinoline derivatives. The specificity of ethylate derivatives for AChE was lower than that of the methylates. Decahydroquinoline derivatives were the most unsuitable AChE and BuChE substrates. Enzyme specificity increased with ring expansion (pyrrolidine, piperidine), whereas hydrophilization (morpholine) reduced specificity. Comparison of the morpholine iodomethylate and acetyl-beta-methylcholine revealed that the former is optically inactive, less hygroscopic and hydrolyzed twice as rapidly by AChE. N-(Beta-acetoxyethyl)morpholine iodomethylate is recommended as a specific AChE substrate. Tables 3; references 5: 5 Russian.
[35-9307]

UDC 547.964.4

SYNTHESIS OF ANOREXOGENIC PEPTIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2383-2384
manuscript received 18 Apr 80

SHVACHKIN, Yu. P. and SMIRNOVA, A. P., USSR Academy of Medical Sciences Institute of Experimental Endocrinology and Hormone Chemistry

[Abstract] The anorexogenic peptide (I) described by Reichelt et al. (1978) has been synthesized in solution. This peptide was separated from the biological fluids of patients suffering from anorexia nervosa and when administered to healthy

experimental mice causes heavily pronounced symptoms of anorexia. This compound is a tripeptide which is a close structural analog of tyroiberine. Used as the starting substances were N-benzoyloxycarbonyl-L-pyroglutamic acid (II), the methyl ether of L-histidine (III) and the triethyl ammonium salt of glycine (IV). The intermediate compounds were the methyl ether of N-benzoyloxycarbonyl-L-pyroglutamyl-L-histidine (V), the methyl ether of L-pyroglutamyl-L-histidine (VI), the hydrazide of L-pyroglutamyl-L-histidine (VII) and the triethyl ammonium salt of L-pyroglutamyl-L-histidyl glycine (VIII). The benzoyloxycarbonyl protective group was removed from compound (V) by means of catalytic hydrogenation in the presence of palladium black. Ion-exchange chromatography was used to separate peptide (I) from the reaction mixture and to purify it. The anorexogenic peptide had a yield of 85 percent with a formula of $\text{CH}_3\text{CO}_2\text{C}_2\text{H}_5-\text{C}_5\text{H}_5\text{N}-\text{CH}_3\text{CO}_2\text{H}-\text{H}_2\text{O}$ in a ratio of 60:20:6:11. References: 2 Western. [26-8831]

UDC 630*864:66.095

NITROPOLYCARBOXYLIC QUINONES AS STIMULANTS FOR MALTING AND ENZYMATIC HYDROLYSIS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 5, 1980 pp 3-4

LERNER, I. G. and CHUDAKOV, M. I., All-Union Scientific Research Institute for the Beer and Nonalcoholic Beverages Industry and Leningrad Technological Institute for the Cellulose-Paper Industry

[Abstract] Amine salts of nitropolycarboxylic quinones (ASNQs), which are economic, easily stored and widely available biostimulants, were used as 1:30 aqueous solutions at the rate of 1 g/kg of barley to stimulate malting. Time of solution application did not affect ASNQ activity; ASNQs activated amylolytic and proteolytic enzyme accumulation by 8-33% and increased malt nitrogen content by 3-13.8%. The quality of malt, and consequently of beer, improved. Malt yield increased by 1.5-3.0%. ASNQs were tested under industrial conditions as 1:20 aqueous solutions at the rate of 1 kg/ton of moistened barley. ASNQ treatment at the beginning of soaking was most feasible. Malt extractability increased by 1.2%. Spent grains from the beer industry are usually hydrolyzed by a combination of fungi, but hydrolysis is not complete because of the presence of pentosan polysaccharides, which are difficult to hydrolyze. An aqueous ASNQ solution was used to treat the grains to be hydrolyzed to increase the sugar yield. The hydrolysate sugar content rose by 14-15% following ASNQ treatment. ASNQs thus have a wide spectrum of action and may be used in the beer industry and other branches of the microbiology and food industry. References 5: 5 Russian. [44-9307]

EFFECT OF pH ON HYDROLYSIS OF VARIOUS SUBSTRATES BY CHOLINESTERASE

Moscow BIOKHIMIYA in Russian Vol 45, No 12, Dec 80 pp 2130-2138
manuscript received 7 Jan 80

LANGEL, Yu. L., SPEEK, M. A. and YARV, Ya. L., Tartu State University

[Abstract] The effect of pH on the kinetics of isomylacetate hydrolysis by cholinesterase in which the limiting rate of stage hydrolysis is the reaction of acetyl enzyme formation was studied. The complete diagram of cholinesterase reaction with participation of different ionization forms of the enzyme is justified on the results as well as the available literature. The effects of pH in all three reaction stages is described quantitatively. The kinetic changes during pseudo-monomolecular reaction reveals greater accuracy compared to measurement of the initial rates. General concepts on the structure of the active center of cholinesterase may explain the participation of the anion center in the specific activity of cholinesterase and the effects of pH during noncovalent bonding of ligands. The active surface of the enzyme shows significant conformational mobility. Figures 3; references 24: 10 Russian, 14 Western.
[53-6521]

CHEMICAL INDUSTRY

THE CHEMICAL INDUSTRY: NEEDS AND RESOURCES

Moscow IZVESTIYA in Russian 3 Jan 61 p 2

[Article by V. Potapov, general director of Production Association Uralkhimplast, Nizhniy Tagil]

[Text] Intra- and intersector disproportions have now occurred in development of the chemical industry. And this is reflected in an increase of the output of plastics, synthetic fibers, dyes, consumer chemical products and an increase of product quality. One can cite the practice of the Production Association Uralkhimplast to see the consequences of this. We are attempting to more fully satisfy the requests for highly effective foundry binders. The production base has been expanded and progressive process flow diagrams have been introduced through our own efforts with minimum expenditures. The promise can now be seen: the capacities of the reconstructed shop will increase during the 11th Five-Year Plan and more binders for machine building will be produced. And an artificial obstacle arises here: our allied workers are not delivering the necessary quantities of furool alcohol--a very important component in foundry binder production.

Orders for powdered bakelite--an important metal substitute--occupy an obvious place in the association's portfolio. Its use in castings for machines reduces by 20-25 percent the consumption of metallurgical blanks, reduces the laboriousness of molding and mechanizes the machining of parts. Our association has all the capabilities of expanding the volumes of delivery of this scarce material--partial reconstruction of the existing capacities with the very minimum expenditures only need to be carried out and the production equipment needs to be renovated. Unfortunately, the local economic initiative has found no support and it is "hanging in the air."

Construction organizations are showing great interest in so-called superplasticizers for concrete--introduction in reinforced concrete production will yield an extensive saving. Experiencing an acute need for scarce raw material, especially for melomine, specialists of Uralkhimplast have developed a new production process--the superplasticizers are produced without using melomine. Construction organizations interested in mass production of these materials, including Mintyazhstroy [Ministry of Construction of Heavy Industry Enterprises] of the USSR, should adopt their share of participation in the design and organization of this production.

The nomenclature and volumes of deliveries of stocks for chemical plant protection, including synthetic orthocresol, must be expanded for the kolkhozes and sovkhoses

in the near future. And here again we are encountering intra-agency confusion in planning. A semifinished product of the highest purity, orthocresol, has already been developed and a significant increase of it is provided by planned tasks, while the user is unprepared to transport and store it.

During the past few years Uralkhimplast has put many production areas into operation which were assimilated during the planned deadlines and which quickly became profitable. This fact confirms the high economic effectiveness of most chemical products which were included in the plant nomenclature and the increased occupational skills of the people engaged in assimilation of the new technology. The experience of profitable operation, specifically rapid assimilation of new production, should have induced the planning bodies to take a more attentive attitude to the prospects of our production association. Everything appears otherwise in practice.

The organizing measures adopted by the government--to develop two union-republic ministries--should have a positive effect on stimulating the sector. Many deficiencies must be corrected to do this. We feel that the draft of the Main Trends should be supplemented with the following proposal:

"Increase the responsibility of planning bodies, especially bodies of material supply and capital construction, in proper distribution of technical and financial resources and in intersector cooperation in order to utilize the available industrial potential with the proper effect and to increase more rapidly the capacities of existing enterprises."

[66-6521]

6521

CSO: 1841

ORIENTATION TOWARD THE FINISHED PRODUCT

Baku BAKINSKIY RABOCHIY in Russian 20 Jan 81 p 2

[Article by M. Dalin, director of All-Union Scientific Research Institute of Olefins, academician of the Azerbaijan Academy of Sciences]

[Text] The following fact was presented at a Plenary session of the Central Committee of the Azerbaijan Communist Party, held in November of last year: the fraction of finished products in the total chemical production of the republic does not exceed 36 percent. The question was raised of the need to implement a complex of measures which would permit significant intensification of orientation toward production of a finished product. It is now felt important during working out the final editions of the Main trends of economic and social development of the USSR for 1981-1985 and for the future in formation of the 11th Five-Year Plan, to adopt operational decisions which comprise this complex. Petroleum refining and petrochemistry are directly related to the field under discussion. Therefore, our suggestions also concern these fields.

One of the large-scale fields of chemistry and petrochemistry of the republic is synthetic rubber production and the byproduct from it--automobile tires and industrial rubber articles. Great success has been achieved in this field by our country. I have in mind primarily the progressiveness of the processes utilized. It is known that industrial production of synthetic rubber was first accomplished in the USSR. Large capacities were created for production of this product, the nomenclature of the product was expanded and the developed brands of rubber were brought close in qualitative indices to natural rubber, which as is known is a still unsurpassed standard. It must be emphasized that development of this industry was based on Soviet developments using equipment manufactured in the Soviet Union.

Success in production of rubber and products of processing it was also reflected in the structure of this industry, in which the specific weight of the finished product is very high. At the same time much must still be done in this field, specifically, in modernization of individual installations, expansion of nomenclature and improvement of the quality of products produced from synthetic rubber.

But there are fields of chemistry and petrochemistry which did not develop as successfully in our country as production of rubber and its derivatives. An example may be the plastics industry. One of the reasons for this situation was the narrow-agency approach to solution of the problem in this field and I would say

underestimation of domestic developments and as a result the excessive desire to acquire licenses for introduction of processes developed abroad.

The lag in the field of plastics production and plastic products was of course reflected in the structure of the chemical industry of our republic. It was partly for this reason that only polyethylene and the simplest articles developed from it were produced from plastics in Azerbaijan. At the same time we do have the capacity to expand production of these products.

One of the main types of raw material for plastics production is ethylene and propylene gases, production of which will subsequently increase in the USSR. A complex for production of them is now under construction at Sumgait at the synthetic rubber plant. Its products will be used to produce benzene, styrene and a number of other chemical substances. The corresponding capacities will be created at the same enterprise from developments of our collective. The products of the complex for ethylene and propylene production will partially be used to produce polyethylene at the Organic Synthesis Association.

Thus, the potential of the chemical industry of the republic will largely increase. And it is important to utilize it to contribute to an increase of the specific weight of finished chemical products. Specifically, it is possible to organize production of polystyrene in the republic--one of the types of plastics which is used in many sectors of industry and in production of consumer goods. The need of our republic for polystyrene is now measured in the tens of thousands of tons. And it will increase even more in the future with regard to development of the electro-technical, instrument building, radio engineering and electronics industries.

It was mentioned above that styrene production will be developed at Sumgait. Only a small part of it will be used to produce butadiene-styrene rubber. The remaining part can be used to produce polystyrene. In the given case industrial implementation of the process for production of impact-resistant polystyrene of exceptionally high quality, developed at our institute, can be accomplished. Creation of a corresponding plant does not require large capital investments. The problem of organizing polystyrene production in the near future must be considered with regard to the surpassing development of the electrotechnical, radioengineering, instrument building and electronics industry in the republic and the increase of the need for polystyrene. This corresponds to the requirement of the draft of Main trends to develop production of high-quality polymers and will contribute to solution of problems of increasing the specific weight of the finished product in the total volume of production of the republic's chemical industry.

The plant being constructed at Sumgait for ethylene and propylene production, besides these products, will produce a number of accompanying products. One of them--butadiene--will be used in synthetic rubber production. And the butane-butylene fraction can be sent to the Novo-Baku Petroleum Refining Plant imeni Vladimir Il'ich to produce high-octane fuel additives and the corresponding plant at the given enterprise can be reconstructed for this purpose. The problem is important. Therefore, it is felt that it must be worked on extensively now and it must be included in the measures on reconstruction of the Baku Petroleum Refining Plants.

Development of composite polymer material production should make a contribution to solution of the problem of improving the structure of the chemical industry in

the republic. The need to expand the output of these materials reinforced and filled with plastics was also emphasized in the draft of the Main Trends. They are being developed on the basis of polyethylene and polystyrene and have the best characteristics, greater strength, longer durability and so on. It must be said that plastics have been used in pure form during the past few years only in small quantities. And now the need for composites based on them will increase. This trend acquires special timeliness with regard to the task of universal conservation of metals posed by the party. The fact is that these composites may replace metals in some cases. Polyethylene-based materials developed at our institute, it must be said, are already being utilized at Machine Building Plants imeni P. Montin and Leytenant Shmidt. Polymer composites will continue to be developed for pipe production and production of other articles. The problem of industrial production of these materials may be included in the 11th Five-Year Plan. This corresponds to the interests of various sectors of industry and also of agriculture.

It should be emphasized that many problems of development of chemistry and petrochemistry in the republic must be resolved in an operational manner during the 11th Five-Year Plan. According to this, we scientists should restructure our own work. Life places special requirements on acceleration of developments, the quality of inventor's inspection of implementation of them and selection and planning of the directions of the scientific search. But it must be said that we still have many deficiencies in this field. Let us talk about the field of inventor's inspection. Having turned over the results of their work to producers, scientists sometimes switch completely to another problem, assuming that they cannot affect the rate of practical embodiment of their ideas. This is of course not true. The duty of the scientist is to "accompany" his development until a new product reaches design capacity. The significance of the institute of inventor's inspection can be increased and a corresponding regulation can be introduced in Chapter 3 of the final text of the Main Trends with regard to the increasing role of scientists in solution of economic problems faced by the country.

The need for timely determination and changing of the direction of investigations and developments and organizational structure of scientific institutions is quite validly discussed in the draft of the CPSU Central Committee to the 26th Congress. Based on this, I feel it is necessary to establish a procedure in which the status of research work already carried out will be analyzed at some level no less than once per quarter. Changes must be introduced in the research plans and one or another investigations must be even completely terminated if necessary. Moreover, the freed labor resources, equipment and funds should be operationally switched to more promising directions.

I would like to return in conclusion to the problem of an increase in the specific weight of the finished product in the total volume of the republic's chemical industry. With regard to the fact that this is an extremely important problem, I feel that it should be emphasized in the final text of the Main Trends and that the following should be added after the regulation "Introduce the Shamkhorskaya GES and Azerbaidzhanskaya GES and the new capacities of chemical enterprises in Sumgait into production: "orient the enterprises to an increase of finished product output."

[66-6521]

6521
CSO: 1841

PROGRESS REPORT ON ASSEMBLERS IN THE CHEMICAL INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Dec 80 p 3

[Article by B. Torokhov, correspondent at the press center of the USSR Minmontazhspestroy (Ministry of Installation and Special Construction Work): "Announcement of Installation Workers"]

[Text] It can be stated, without fear of mistake, that the Ukrainian assemblers never before worked in such friendship and so productively as in the last year of the current five-year plan. During those days, the workers of the main trusts, Dneprometallurgmontazh, Promtekhmontazh-2, Donbasspromkhimmontazh and their numerous subcontractors have concentrated all their efforts on preparing for the start up of two large facilities for the production of carbamide at the Cherkasskoye and Dneprodzerzhinsk Azot industrial associations, and the sulfuric acid complex at the Konstantinovskiy Chemical Plant. Finishing work is being conducted on each project, and separate elements and entire technological lines are being tested. The assemblers have a distinct goal, to have the first production on 20-25 December.

The competition is headed by the complex cost-accounting brigades of A. Onyayenko, Hero of Socialist Labor, L. A. abskiy, Honored Construction Worker of the USSR, Yu. Voloshchenko and V. Mula kiy, Outstanding Workers of Communist Labor.

"With the start up of these complexes," states A. Guzey, head of the administration for the construction of enterprises of the chemical industry under the Ukrainian Ministry of Installation and Special Construction Work, "the five-year task stipulated by this republic, concerning the start up of facilities producing mineral fertilizers will be completely fulfilled.

Since the start of the current five-year plan, the builders and assemblers of the Ukraine have put on line more than 25 major complexes for the production of mineral fertilizers and pesticides. Among the new plants, there are such giants of large-scale chemistry as the Odessa Port Plant, facilities at the Yavorovskiy Mining and Chemical Plant, ammonia installations at the Dneprodzerzhinsk and Cherkasskoye Azot associations, Gorlovka Styrene Association and others. Many of the complexes were erected in advance of the target dates. For example, the time for installation of equipment was reduced by 3 months at the Odessa Port Plant, which was built from

scratch. Under the Tenth Five-Year Plan, the workers in departments of the Ukrainian Minmontazhspetsstroy accomplished almost 30% more work on the construction projects for production of mineral fertilizers than in the preceding five-year plans.

It must be stressed that, thanks to the proper allocation of manpower and resources, and cooperation of purchasers, contractors and subcontractors, the main capacities for mineral fertilizers were started up within the first 4 years of the five-year plan. Most of them have already reached planned capacity, which creates good conditions for augmenting the production of mineral fertilizers in the current five-year period.

Like all workers, the assemblers of the Ukraine are actively studying the draft of the CC CPSu for the 26th Party Congress on the "Main directions of economic and social development of the USSR in 1981-1985 and over the period up to 1990." First of all, the personnel of assembly subdivisions are searching for ways of "building rapidly, economically and with technological sophistication," as written in that document. Experience, accumulated during the five-year plan, will to a large extent help to solve this problem in the future. Virtually all of the main technological equipment for mineral fertilizer installations was assembled in large units [blocks] weighing 50 to 100 or more tons. As a rule, they were not assembled on installation sites, but on well-equipped production bases. The bases in Severodonetsk, Dneprodzerzhinsk, Gorlovka and other cities are generally not inferior to plant shops in their technological equipment.

Use of the progressive technology of large-unit assembly has speeded up considerably welding and insulation work, as well as work on chemical protection of equipment. More progressive methods were also found for performing this work. For example, the workers of the Ukrmontazhkhimzashchita Trust used a new fettling method in building the Odessa Port Plant. As a result hundreds of thousands of rubles were saved, while the time within the work was done was reduced to almost one-third. Altogether, as a result of industrialization of the assembly work, the time for installing equipment was reduced by about one-quarter.

It can be stated that the personnel of the Ukrainian SSR Minmontazhspetsstroy have made a good announcement about successfully creating new capacities for producing mineral fertilizers under the next, 11th Five-Year Plan.

[79-10,657]

10,657
CSO: 1841

CONSTRUCTION OF TOGLIATTI NITROGEN PLANT

Moscow EKONOMICHESKAYA GAZETA in Russian No 43, Oct 80 p 1

[Article: New Giant of the Chemical Industry]

[Text] Construction of one of the largest objects of the chemical industry--the Togliatti Nitrogen Plant--was begun during the 10th Five-Year Plan. Three ammonia production complexes and one urea production complex were put into operation last year. An additional urea production complex was recently put into production here. Construction-installation and starting-adjusting operations on two additional ammonia complexes are to be completed by the end of 1980.

The product will be sent to agricultural users. As is known, mineral fertilizers significantly increase the yield of various crops.

The large-capacity ammonia and mineral fertilizer production units were constructed by the latest engineering technology using large unit capacity apparatus. The heat of reactions is utilized to the maximum extent for steam production, which drives the turbines of the pump-compressor equipment.

The progressive technique is not only economical. There are no discharges of chemically harmful substances into the atmosphere and reservoirs, while the slurries from the solutions are rendered harmless in biological treatment installations.

Construction of a new object--a liquefied carbon dioxide plant with capacity of two million tons annually--has now begun. An installation of this capacity is being constructed for the first time. The raw material for it will be the carbon dioxide wastes from ammonia production. The liquefied carbon dioxide will travel by pipeline to nearby fields for increasing the efficiency of oil extraction from the ground.

When the sixth large-capacity ammonia production unit with output of 1,360 tons per day is completed during the 11th Five-Year Plan, the Togliatti Nitrogen Plant will become the world's largest ammonia supplier. The annual production volume will comprise more than 2.5 million tons of ammonia and approximately one million tons of urea. This amount of ammonia was produced by all USSR plants in 1963 and this amount of urea was produced in 1965.

Having taken on a labor watch in honor of the 26th CPSU Congress, the builders, installers and chemists of the Togliatti Nitrogen Plant have decided to bring the production lines for ammonia and urea production to design capacity ahead of schedule.

[65-6521]

6521

CSO: 1841

PROGRESS REPORT ON CONSTRUCTION OF PROJECTS FOR THE PRODUCTION OF FERTILIZERS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Jan 81 p 3

[Article by I. Timofeyev, editor of the newspaper ZA KOMMUNIZM:
"Coordination Resolved", Kingisepp, Leningrad Oblast]

[Text] "Start up the complex." This order echoed at "Fosforit" on the eve of the new year. The furnace came to life. The ammophos granulating and drying drum started to turn at full speed. Instrument needles began to spin. The following line appeared in the log of the shift foreman: "The temperature has been raised to the required parameters and pulp is being delivered...." Then, in large letters: "Ammophos coming out!!!"

The 10th Five-Year Plan was an important stage in the work history of "Fosforit" [Phosphorite]. One the nation's largest plants for the production of sulfuric acid, for which the national economy is experiencing an increasing need, has been completed. The association now produces over a million tons per year of this item. Now, on the boundary line between two five-year plans, the third ammophos [ammonia phosphate fertilizer] complex has started to produce. Its annual productivity is 860,000 tons of complex mineral fertilizers enriched with nitrogen and phosphorus.

The work performed to erect "Ammophos-3" was scheduled to require 34 months, but it was finished in 2 years. This is an appreciable advance. But, at the present time, it is no longer surprising. A rapid pace of construction at "Fosforit" had already begun under the 8th Five-Year Plan. At that time, all of the projects had been constructed ahead of schedule. With the years, the accumulated knowhow helped make it a rule to work without interruption or fuss. And this is the way it was when erecting the new complex.

"Ammophos-3" consists of 53 projects: 26,000 cubic meters of precast reinforced concrete, 15,000 tons of metal construction, 200 km electric cables and 4000 tons of steel pipes, plus 5 million cubic meters of moved ground. A. Myachin, first secretary of the Kingisepp Party gorkom tells us: "It was not easy to accomplish on such a scale, let alone on a tight schedule. The communists on the construction project realized that the plan could be fulfilled only with clearcut coordination of all elements of construction. This is how an agreement was reached on collaboration between the designers, general contractor and customer. The responsibility of each team was instrumental in assuring the high effectiveness of the agreement.

A unified Party group worked on the project under construction. The council of brigade leaders of all 36 organizations involved in erecting the complex served as its reliable assistant. Acting in harmony, the Party group and brigade leader council constantly checked the work schedule, coordinated the actions of sub-contractors, disseminated information about the best knowhow and together "ironed out" the "weak" points. Without stopping, the brigades handed to one another the finished jobs and, without delay, went on. This is how the "work relay" operated, and the road for it was paved by good engineering preparation. This is what Yu. Malakhov, head of Trust No 31 of Glavzapstroy [Main Administration for Construction in the West], had to say about it:

"Virtually all of the brigades and even sections [sectors] worked under the same rules. Everything that could be mechanized in our situation was mechanized. The entire construction project was divided into subcomplexes. This made it possible to prepare schedules that clearly and distinctly specified which work and in what order each section was to be completed. The brigade contract guided the teams toward achieving the end results. Here is an example. The brigade of M. Guni, who is an expert in this method, delivered equipment for installation and the brick foundation for the main ammophos building 1 month ahead of schedule."

"Ammophos-3" differs significantly from its predecessors. In particular, there is new handling of the problem of controlling and supervising production: an electronic computer will control the technological process. There has been intensification of measures to protect the environment: with the creation of recycling, "Fosforit" will reduce significantly the use of clean water from Luga River. But the main thing is that about 12 million tons of vitamins for the fields will come off the conveyers under the 11th Five-Year Plan. The specialists have estimated that 1 ton of granulated spheres per hectare of plowed fields will yield an increment of 26 quintals of potatoes and 5 quintals of wheat.
[79-10,657]

10,657
CSO: 1841

PROGRESS IN PETROCHEMICAL PLANT CONSTRUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 31 Jan 81 p 1

[Article by V. Noskov, correspondent of SOTSIALISTICHESKAYA INDUSTRIYA:
"High Speeds," Kstovo]

[Text] From a distance one can already see the transparent red calico banner blazing over the entire wall of the small car where the headquarters for construction of the Kstovo Petrochemical Plant are installed. The words, written in letters almost half a meter large, make the following appeal: "Comrades! Let us deliver the first production by the day that the 26th CPSU Congress starts."

L. Kotlyar, director of the plant, declares: "We have no doubt that everything we have planned will be done. This is assured by the achievements of the construction workers and subcontractors. In January they are working with an enviable return. And the results are already evident: for the first time in our country, and in the wintertime, we were able to obtain a so-called intermediate product, the raw material for subsequent processing."

V. Kuznetsov, manager of the general contractor Neftezavodstroy [oil refinery construction] Trust No 5, adds:

"Delegates from 20 oblasts are working so well that they are already 3 months ahead of schedule on erecting the plant. Particularly great achievements were made in recent times."

One senses a nonstandard approach to the job on virtually every step here. For the first time in our country, the workers of the Termoizolyatsiya [heat insulation] Trust used a new method of packing mastic to insulate equipment and pipelines. This work was done at a minus temperature without heat, for which additional time and funds were usually expended.

The assemblers of the Volgoneftekhimmontazh Trust also saved more than a month; they rejected the traditional method for installing a burner that requires 120 meters of chimney made of reinforced concrete. The workers assembled it on the ground, and then using a special device lifted it and put it in place.

The builders themselves also made a contribution to get ahead of schedule. They erected special overhead walkways to lay numerous cables and pipes.

Previously, all this had been installed in trenches on the ground. This innovation not only made it possible to accomplish the work faster, but to release 200 people for other operations.

The names of brigade-leaders I. Denisov, B. Pankov, K. Isakov and T. Varentsov are well-known at the construction site. The flag of glorious labor was raised more than once in honor of the groups that they head: on pre-congress duty, they are achieving 1.5-2 times the shift standards per day, and they are leading in the socialist competition.

V. Kondrat'yev, general director of the Gor'kovnefteorgsintez [Gor'kiy Oil Organic Synthesis] Industrial Trust, states: "The achievements give us joy and confidence that we shall be able to start production in the next few days. With the start up of this new enterprise, there will be a significant increase in output of extremely valuable petroleum products. This was expressly the task put to us in the draft of the 'Main directions'..."

... It was already twilight when we left the plant. The second shift of construction, installation and insulation workers had started to work. Next to them, shoulder to shoulder, the production workers were also busy; together with the brigades of finishing workers, they are learning about the new equipment, which will very soon start production to be credited for the first year of the 11th Five-Year Plan.

[80-10,657]

10,657
CSO: 1841

POLYPROPYLENE PRODUCTION IN SIBERIA

Moscow PRAVDA in Russian 8 Mar 81 p 1

[Article by S. Vtorushin (PRAVDA correspondent): "There is Siberian Polypropylene," Tomsk]

[Text] In a report to the 26th CPSU Congress, Comrade L. I. Brezhnev mentioned the Tomsk Chemical Plant among the enterprises that form the nucleus of the modern chemical industry. Recently, its personnel achieved a great labor victory: the first polypropylene to be produced in Siberia was obtained ahead of schedule in the course of complex testing of technological lines, as had been planned in the socialist obligations.

It is not by chance that the site for the largest plastics plant was chosen in West Siberia. Today, every other ton of petroleum and every third cubic meter of natural gas are recovered there. Under the current five-year plan, there will be a substantial increase in recovery of these most valuable forms of chemical raw material. Western Siberia, from the polar region to the southern industrial zone, is intersected by many large oil and gas pipelines. Oil from the Samotlor of Tyumen' and northern oil fields of Tomskaya Oblast travels over one of them to refineries in southern Siberia. This artery will become the main "raw material base" of the petrochemical combine.

Huge buildings of a most complex industry have been erected on the shore of the Tom' River. The Tomsk giant has no equal in the nation in either capacity or equipment. With its start up, there will be considerable expansion of use of plastics in the national economy.

In many respects, this project can serve as an example for erecting similar enterprises. It began with accelerated erection of the base of the construction industry. There, large facilities were put in operation for the production of pre-cast reinforced concrete, solutions and concrete, enterprises for repair of equipment and power plants. Special attention is given to protection of the environment. The technological cycle of the combine is designed for closed supply of water, and large treatment installations have been erected there.

P. Pronyagin, head of the Khimstroy administration and delegate to the 26th CPSU Congress, states: "The workers acquired priceless experience on this construction project. The enormous volume of work compelled us to search for new forms of management of production. And they were found. We achieved the goal of having all of the management departments and subcontractor organizations perform

preassigned unit tasks. This made it possible to use technology and resources more efficiently, as well as to plan production in a centralized and orderly fashion."

The komсомол youth brigade of S. Demidov under the Khimstroy Administration is justifiably considered to be one of the best here, and in a persistent competition it won the honorary right to bear the name of the 26th CPSU Congress. This team erected all 36 buildings of the polypropylene complex.

The brigade of A. Nikolayenko, from the Prommekhantomontazh Trust installed the unit for air distribution at the nitrogen and air station three times faster than scheduled. The brigades of B. Burmatov, R. Mukhametdiyev and many others worked with excellence. Quite a few work records were set at one of the largest construction projects of Siberia.

The production workers prepared well for the final phase of construction. Immediately after the assemblers left, they began the complex testing of equipment. All this was instrumental in the success of the work.

The polypropylene facility is merely the first section of the enterprise. The main work is presently being moved to the construction site for a methanol facility. Next year, the nation's largest installation for methanol production will have to start operating.

[80-10,657]

10,657
CSO: 1841

ACHIEVEMENTS IN THE CHEMICAL INDUSTRY

Vilnius SOVETSKAYA LITVA in Russian 8 Jan 81 p 1

[Interview with Al'gimantas Petronis, head of the department of the chemical industry of the Lithuanian Gosplan, by Romual'das Chesny, correspondent of EL'TA]

[Text] [Question] The chemical industry plays a particularly large role in development of productive forces of the republic and raising the standard of living of the working people. What has it achieved in the years of the 10th Five-Year Plan?

[Answer] The gross production of this republic's chemical industry increased by about 38% during the years of the 10th Five-Year Plan. The efficiency of production has improved significantly at all of the enterprises. Almost 75% of the increment in production was obtained by increasing the productivity of labor. A rather large program of construction work has been fulfilled. In these 5 years, capital investments in the chemical industry constituted more than 180 million rubles.

Still, it must be admitted that this sector has not performed the tasks under the five-year plan in full with regard to some items. This applies, first of all, to the production of mineral fertilizers. It was adversely affected by the insufficient supply of gas, mistakes made by planners, delays in construction of some ancillary projects. Of course, the production personnel themselves also failed to make use of all the reserves for intensifying production and improving its quality.

Nevertheless, even in the past 5 years, the "large-scale" chemistry of this republic developed at a rapid pace. The second section for the production of nitrophos and a very large unit for the production of ammophos were started up at the Jonava "Azot" [nitrogen] Industrial Association. Very recently, remodeling was completed of the ammophos shop at the Kedaynyay Chemical Plant; there, the production of these valuable concentrated fertilizers has doubled. New capacities, as well as updating of equipment, made it possible to increase the production of mineral fertilizers by more than a million tons annually under the 10th Five-Year Plan. It is not difficult to realize what this means: one ton of mineral fertilizer increases the harvest by about 1.3 tons, while each ruble invested to purchase it yields 2 rubles of net profit in the same year.

Improvement of the structure of the "earth's vitamins" is also producing perceptible results. While complex and concentrated mineral fertilizers constituted 60% of all such products at the end of the 9th Five-Year Plan, they now constitute 74%.

Yet such fertilizers are much more effective, and much labor and resources are saved on transporting and using them.

[Question] Under the 10th Five-Year Plan a new sector of industry, petrochemistry, was created in Soviet Lithuania. Please tell us what significance it will have to this republic's economy.

[Answer] More and more mazut [fuel oil], gasoline and diesel fuel are needed with the intensive development of industry in this republic, as well as transportation and agriculture. Previously, all of these petroleum products had to be brought in from other economic regions of the country. Can you imagine what such transportation cost and how crowded the railroads were when millions of tons of such products were brought in annually. The cost is about one-fifth of this when oil is pumped over pipelines and its products are manufactured at the site where they are used on a mass scale.

The first section of the oil refinery in Mazheykyay, which was built in accordance with the decisions of the 25th CPSU Congress, will make it possible to improve significantly the supply of fuel to this republic.

[Question] What advances have been made in microbiology, which is one of the youngest sectors of the chemical industry?

[Answer] Feed yeast, enzymes and premixes have now become good helpers in different sectors of the national economy. These products are particularly needed by agriculture. For example, 1 ton of feed yeast used as a feed supplement saves up to 7 tons of grain. Enzymes are gaining increasing use in industrial technological processes.

Both enterprises of the microbiological industry, the Kedaynyay Bioplant and Vilnius Experimental-Industrial Enzyme Plant, were modernized and refurbished with new equipment. In the last 5 years, there has been almost a 30% increase in output of enzyme products and premixes.

A large research center, the Institute of Applied Enzymology, was opened at the base of the laboratory of the Vilnius Enzyme Product Plant. At the present time, new and effective products are being developed there, and areas of broader use thereof are being sought.

[Question] The chemical industry is an important supplier of consumer goods. What has been done to increase their output and improve the product quality?

[Answer] First of all, I should like to mention the "big silkworm," the Kaunas Synthetic Fiber Plant imeni 50th Anniversary of the Great October Revolution. Under the 9th Five-Year Plan, a broad remodeling program was implemented. Virtually without enlarging the main production space, at the end of the 5-year period the enterprise produced almost 2000 tons more acetate and triacetate fiber than in 1975. This means that the enterprise can weave fabric for about 5 million dresses from the additional annual output.

Output of consumer chemicals is increasing at a rapid pace. Housewives now have a variety of products for laundry and cleaning, many plastic items for household use have been produced, as well as small cosmetic appliances ["avtokosmetika"] and other products. At present, the chemical industry produces household goods worth 84 million rubles per year, which is almost a third more than 5 years ago.

[Question] What are the prospects of future development of the chemical industry?

[Answer] In the draft of the CC CPSU for the 26th Party Congress, considerable attention is devoted to the continued development of the chemical industry. It is planned to build and deliver for operation the second section of the Mazheykyay Oil Refinery in our republic, and it will double the capacities for production of petroleum products.

There is much work in store to continue with the renovation of the Kedaynyay Chemical Plant. There will be a reduction in production of ordinary superphosphate there, but an increase in production of concentrated fertilizers. It is planned to implement a broad program to improve the efficiency of using existing equipment at the Ionava Azot Industrial Association. All this will make it possible to augment production of mineral fertilizers by about 25% in the years of the 11th Five-Year Plan. In the future, there will be further improvement of the quality of consumer goods and increase in assortment thereof.

[81-10,657]

10,657

CSO: 1841

NEW PLASTICS PLANT STARTED UP IN KUMA RIVER REGION

Moscow SOVETSKAYA INDUSTRIYA in Russian 15 Jan 81 p 1

[Article by I. Shlyakhtin: "A Plant Has Grown. Plastics Plant in the Kuma River Region Delivered to the State Commission," Stavropol']

[Text] There has been a long wait for this event. Now, this giant of chemistry, which grew up in the spacious steppe next to Budenovsk, has started working for the five-year plan.

There are quite a few shining pages in the history of its construction. Was it not a bold and original procedure to deliver from Leningrad three 220-ton reactors in unassembled form and then install them? And one year later there was the astounding and bold operation of erecting and installing the nearly 100 meter tall polyethylene columns, which took 30 hours instead of 2 months. For the first time in our country, the method of pouring polyurethane foam was used to insulate pipes and equipment that operate at very low temperatures against the heat.

... Thus, the first commercial batch of high-density polyethylene was obtained from Stavropol', and the national economy will receive 200,000 tons of it. The start of this plant is important to the national economy. There are many enterprises in the chemical, light, food, timber and electric power industries waiting for its product. The production of polyethylene will remove the shortage of film and plastic pipes for land development construction. In addition to polyethylene, the plant will produce 125,000 tons of propylene, which is valuable chemical raw material. The production of these amounts will reduce by more than one-half the existing shortage of this product. The capacities of this plant make it possible to produce 100,000 tons of benzene, which it is planned to use in the manufacture of synthetic fibers, rubber, varnishes and paints.

The plant is also important because it is a sort of conductor of the latest achievements of scientific and technological progress. There are many very new developments and discoveries of modern scientists and specialists in the installed equipment, machinery and apparatus. This enables the plant to produce with low expenditures for raw material, fuel and energy. As compared to existing enterprises in the same field, the output per worker at the Kuma River Plastics Plant will be 7-8 times greater. All of the technological sections are equipped with an automatic control system based on computer technology, and this assures not only reliable monitoring of the industrial process, but change therein to automatic modes.

D. Lukin, director of this enterprise, tells us: "The employees of the Kuma River Plastics Plant have a great future. It has just been started up, and already there are plans for its future development and expansion."

A solemn meeting was held in Budenovsk on the occasion of starting up this plant. Its participants unanimously approved of a letter to the Party Central Committee, Presidium of the USSR Supreme Soviet and personally to comrade L. I. Brezhnev. The plant workers assured them that they will make every effort to welcome the 26th Party Congress in a worthy manner.
[81-10,657]

10,657
CSO: 1841

BRIEFS

REPORT ON DIESEL FUEL PRODUCTION--The installation for urea dewaxing of diesel fuel put out its first production at the Volgograd Oil Refinery. This large complex was designed to produce tens of thousands of tons of wax annually to be used for the production of protein and vitamin concentrates as feed supplements used in the livestock industry. The diesel fuel itself, which is obtained as a result of processing petroleum products at this installation, is freeze resistant, and it can be used under the climate conditions of the Urals, Siberia and Far East. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jan 81 p 2] 10,657

PETROCHEMICAL PLANT ADDITION--Tomsk (TASS)--A giant of the petroleum industry is on the verge of starting up. The panorama at the construction site of the Tomsk Petrochemical Combine is changing rapidly. Installation of a methanol plant has begun there; methanol is the raw material for manufacturing plastics and synthetic resins. This plant, with a capacity of 750,000 tons per year, as reported by TASS correspondent, A. Russkiy, will be put on line this year. It is planned to start polypropylene production amounting to 100,000 tons annually by the time the 26th Party Congress convenes. At the present time, assemblers and production workers are both completing the finishing touches in the shops. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Jan p 2] 10,657

BUTYL ALCOHOL COMPLEX COMPLETED--Salavat--A large complex producing butyl alcohol has been received for operation in the Salavatnefteorgsintez Association. It is furnished with highly productive equipment, and all technological processes are automated and mechanized. A large heat-treatment facility has been constructed to treat liquid waste. With the start up of the new capacities, the butyl alcohol industry of Salavat became the largest in the nation. This product will be used to produce ether, solvents, plasticizers, herbicides and other petrochemical products needed by the national economy. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jan 81 p 1] 10,657

TOMATOES IN OIL RECOVERY--Baku (TASS)--The waste from processing tomato, squash and pepper stalks found unexpected use in recovery of oil. Even a negligible amount thereof in an aqueous solution pumped into an oil-bearing formation turned out to be sufficient to increase the yield. Substances of plant origin, which improve dramatically the oil-flushing properties of water, not only increase the recovery of oil, but reduce the volume of fluid to be pumped into the stratum. The staff of the

Institute of Deep Oil and Gas Deposits of the Azerbaidzhan Academy of Sciences, who proved the technological and economical advantages of using the waste from plant processing, transmitted their findings to the oil workers of Baku. The scientists have concluded that there is a good raw material base in this republic for utilizing this method on oil-bearing formations. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jan p 2] 10,657

PROGRESS AT TOMSK CHEMICAL PLANT--TASS--After a complex trial of the intricate technological line at the Tomsk Chemical Plant, the first kilograms of product have been manufactured. The assemblers and power plant workers, transportation personnel and petrochemists who participated in erecting this enormous enterprise of Siberia met the obligations that they had assumed in honor of the 26th Party Congress. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 9, Feb 81, p 24] 10,657

10,657
CSO: 1841/80

BRIEFS

NEW CHEMICAL PLANT IN PRIDONSKOYE--Preparations for the 26th CPSU Congress, the decisions of the October (1980) plenum of the CC CPSU and the tasks outlined in the plan of the CC CPSU for the 26th Party Congress on "The main directions of economic and social development of the USSR in 1981-1985, and up to 1990" inspired a new influx of creative activity and enthusiasm among the construction, installation and production workers, as well as all participants in the erection of the Pridonskoye Chemical Plant in Voronezhskaya Oblast. In their desire to make a concrete contribution to solving the socioeconomic problems of the 11th Five-Year Plan, the participants in the construction of the chemical plant in Pridonskoye have taken on increased socialist obligations for 1981. They intend to complete construction ahead of schedule and start up capacities to produce 450,000 tons of ammonia per year by 15 September 1981 on the basis of broad deployment of competition among brigades, sections and organizations, development of cost accounting, intensification of organizational and mass scale political work among the worker groups. The annual plan for construction and installation work on the project is to be fulfilled by 1 September, and housing for the plant workers totaling more than 14,000 square meters is to be made ready. The participants in this construction are appealing to the USSR Ministry for the Production of Mineral Fertilizers, Soyuzglavkhimkomplekt [Main Administration for Ensuring the Supply of Complete Sets of Equipment, Instruments, Cables, and Other Products for High-Priority Construction Projects of the Chemical and Pulp and Paper Industries] of the USSR Gosnab, to the workers of the Ruzayevskiy and Tuymazinskiy plants of chemical machine building, and to all supplier enterprises to furnish expeditiously to the construction project equipment and cables in accordance with coordinated schedules. We appeal to the groups of construction workers of our country to become actively involved in the socialist competition for fulfilling ahead of schedule the plans for starting up production capacities to produce mineral fertilizers. The socialist obligations were discussed and approved at meetings of all participants in the construction of the Pridonskiy Chemical Plant. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Jan 81 p 1] 10,657

BREZHNEV PRAISES NEW SYNTHETIC FIBER PLANT--Dear Comrades: It was rewarding to learn that, for the first time in our country, a plant was started up in Siberia that produces a new type of strong synthetic fiber. This fiber is a good replacement for cotton, and it will find use in manufacturing a wide assortment of high-quality fabrics, knitwear and other textile goods. Erection of the Sibvolokno [Siberian fiber] Plant in the rigorous conditions and climate of Krasnoyarskiy Kray is a worthy gift for the 26th CPSU Congress, a concrete contribution to the task of raising the standard of living of the Soviet people. This enterprise is equipped with modern technology, it has a high level of mechanization and automation, and is furnished with highly productive Soviet equipment. Your achievement

is the result of intensive and selfless work, highly creative activity of the personnel of construction and assembly organizations, production workers, machine-building enterprises, designing and scientific research institute; it is the result of much organizational and political educational work by Party, trade-union and komsomol organizations. I warmly congratulate you for this remarkable victorious work, and wish to express my confidence that you will continue to struggle persistently for further build-up of production capacities and making them operational ahead of schedule. Dear comrades, I wish you success in your work in the 11th Five-Year Plan, good health and personal happiness. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Feb 81 p 1] 10,657

NEW GAS LINE--TASS--The 26th CPSU Congress is being greeted with new work achievements by the chemical workers of Tadzhikistan: Commercial gas has been delivered to the Yavan Electrochemical Plant. This is an important stage in starting up new chemical production at the young enterprise in the South Tadzhik industrial complex. The photograph (by A. Poddubnyy) shows an installation for the production of liquid chlorine. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 6, Feb 81 p 3] 10,657

10,657
CSO: 1841/81

BRIEFS

FUEL ADDITIVE PRODUCTION--The collective of the Kremenchug Petroleum Refining Plant is preparing to produce the first lot of imide additives on the eve of the 26th Party Congress. This product is very necessary to the national economy. It significantly increases the quality of motor oils, increases the operating life of internal combustion engines and provides failure-free operation of them under severe Arctic and hot southern conditions. The imide additive shop is related to the entire plant. Workers of the Kremenchugneftekhimstroy Trust installed 170 kilometers of pipelines, 1,700 tons of assembled steel sections, 18,000 cubic meters of precast concrete and almost 2,000 tons of production equipment within a short time during construction of it. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Jan 81 p 2] 6521

POLYETHYLENE PRODUCTION--Buden'novsk, Stavropol'skiy Kray--The builders and operators accepted with great enthusiasm the hearty greeting of General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet Comrade Leonid Il'ich Brezhnev to all participants of construction and introduction of the Prikomsk Plastics Plant. A solemn meeting was held on this occasion in the new Olimpiya movie theater. The first secretary of the Stavropol' Party Kray Committee, Deputy to the USSR Supreme Soviet V. S. Murakhovskiy read the greetings of Leonid Il'ich Brezhnev. The deputy minister of the chemical industry of the USSR Ye. F. Vlaskin noted that introduction of this plant will contribute to an increase in the efficiency of many sectors of industry and to acceleration of technical progress. Production efficiency is such that construction of the plant will be repaid within two years due to the use of its products in the national economy. The participants of the meeting adopted a letter addressed to the CPSU Central Committee and personally to Leonid Il'ich Brezhnev in which warm gratitude was expressed for the high evaluation of labor and they assured him that they would apply every effort to successfully fulfill the pledges adopted in honor of the 26th Party Congress. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Jan 81 p 1] 6521

BAKU VISIT--Member of the CPSU Central Committee, Deputy Chairman of the USSR Council of Ministers L. A. Kostandov arrived at Baku on 27 January. Comrade Kostandov was met at Baku airport by the chairman of the council of the ministers of the Azerbaijan SSR G. N. Seidov, the secretary of the Central Committee of the Azerbaijan Communist Party K. M. Bagirov and the First Deputy Chairman of the Council of Ministers of the Azerbaijan SSR S. B. Tatliyev. [Text] [Baku BAKINSKIY RABOCHIY in Russian 28 Jan 81 p 1] 6521

PETROLEUM REFINING--The first unit of the Mazheyka Petroleum Refining Plant has been brought up to design capacity ahead of schedule. The Lithuanian chemical workers have fulfilled an important item of the pledges adopted in response to the recent greeting of L. I. Brezhnev with regard to successful fulfillment of tasks on construction and introduction of the enterprise. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 43, Oct 80 p 2] 6521

CS0: 1841

BRIEFS

AMMONIA-PRODUCING FACILITY--Kuybyshev--The fourth unit for ammonia production at the Tol'yatti Nitrogen Plant has delivered the first thousands of tons. Its annual productivity is 450,000 tons of fertilizers. In all, there are already capacities in operation at the new plant that can produce 1.8 million tons of liquid ammonia, the main raw material for production of nitrogen fertilizers, per year. There are also two highly productive carbamide-producing units in operation. Under the 11th Five-Year Plan, the plant will continue to develop. There are plans to build three more large installations for liquid ammonia and liquid carbonic acid. Construction will be completed on a unique "fertility run": the Tol'yatti-Odessa ammonia pipeline. Fertilizers will travel over this pipeline to the fields of 30 oblasts of the RSFSR and the Ukraine. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jan 81 p 2] 10,657

INCREASED FERTILIZER PRODUCTION--Gorlovka, Donetskaya Oblast (TASS)--The Gorlovka "Styrene" Association has emerged among the major suppliers of mineral fertilizers, as it consistently increases the production of fertilizers and raw material used for them. A new shop with a capacity of 240,000 tons per year, for the production of mild dilute acid has been started up there. As was planned in the increased pre-congress obligations assumed by the construction and chemical workers, this important project was erected and put on line 4 months ahead of schedule. This achievement was a continuation of the outstanding work of chemical workers, which began under the 10th Five-Year Plan. In these years, capacities have been started up at this enterprise for the production of 990,000 tons of nitrous fertilizers and 900,000 tons of ammonia per year. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jan 81 p 1] 10,657

HIGHLY PRODUCTIVE FERTILIZER SHOP--Cherepovets--Less than a year was needed for the chemical workers of Cherepovets to produce the millionth ton of mineral fertilizers. Thus, the capacity of the ammophos shop at the chemical plant was achieved ahead of schedule. This occurred because of the effective socialist competition in honor of the 26th Party Congress. The chemical workers took on the obligation to furnish an additional 150,000 tons of the product by the day that the congress convenes. The shift of A. Shchekoturov, the electrician brigade of V. Sokolov and fitter [or mechanic] brigade of F. Artamonov are mentioned there among the winners of the competition. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jan 81 p 1] 10,657

NEW CARBAMIDE-PRODUCING COMPLEX--A new complex for the production of carbamide was started up ahead of schedule at the Dneprodzerzhinsk "Azot" [nitrogen] Association. It has a production capacity of 700,000 tons per year. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 2, 1981 p 3] 10,657

NEW FERTILIZER-PRODUCING UNITS--Smolenskaya Oblast--Complexes of units for the production of ammonium nitrate and mild nitric acid have been started up at the Dorogobuzh Nitrogen Fertilizer Plant. Concurrently, facilities have been started up for the production of catalysts, polyethylene containers, and an installation for chemical treatment of industrial waste with productivity of 1,450 cubic meters per day. The start up of this new major facility at the nitrogen fertilizer plant is a guarantee of continued increase in fertility of the fields. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Feb 81 p 2] 10,657

SHARING PROGRESSIVE KNOWHOW--Sumy (TASS)--"The Pre-congress socialist obligations have been successfully fulfilled. In addition to the assignment at the start of the year, the enterprises delivered 6000 tons of mineral fertilizers." This is an entry made in his diary by A. Yatsenko, an instrument control man at the Sumy "Khimprom" [chemical industry] Industrial Association.

Aleksey Ivanovich [Yatsenko] has been keeping a unique diary for 5 years of the "relay race" of excellent achievement by the team, the socialist competition for increasing efficiency of production and improving work quality. Communist A. Yatsenko wrote the first line in his diary at the 25th CPSU Congress, to which the chemical workers elected him as a delegate. The instrument control man also makes use of his notes as a propagandist for the school of advanced knowhow, telling about the changes that have occurred at the enterprise in the period between congresses. Under the 10th Five-Year Plan, new shops were added to the association for the production of sulfuric acid, as well as a section of an ammophos complex and shop for liquid mineral fertilizers. The residential area has been improved further and it has grown more attractive ["cosy"]. Schools, a dispensary and swimming pool have been built. The association also has its own sanatorium complex in Yalta. All this is the result of the excellent [shock] work of chemical workers. Thanks to achieving the planned capacities ahead of schedule, the association workers increased the production of granulated fertilizers by almost 1.5 times over the past 5 years. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Feb 81 p 2] 10,657

10,657
CSO: 1841/81

ENERGY CRISIS AND CHANGES IN THE STRUCTURE OF THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO ORSHCHESTVA IM. D. I. Mendeleyeva
in Russian No 5, 1980 pp 544-552

DEDOV, A. G., candidate of economic sciences, director of the Scientific Research
Institute of Technical and Economic Research

[Abstract] The effect of the energy crisis together with higher prices and inflation on the chemical industry is reviewed. One effect has been the search for more energy-efficient processes and more widely available raw materials. Measures taken by the industry have included the control of expenses and losses, utilization of secondary materials and energy resources and the development of new technological processes and energy-conserving technology. The energy crisis has also slowed the growth of the industry and has shifted emphasis to small-scale rather than large-scale chemical production. Capital has also been used more for modernizing existing equipment and facilities than for new construction, and industrialized countries have invested more heavily in developing countries. Trade relations between socialist and western countries have also improved. Improvements have been made in the production of aromatic hydrocarbons by extraction with the use of more efficient solvents, in catalytic and thermic hydrodealkylation of toluene, in the chlorine and nitrogen industries, in phosphorus and phosphoric acid production and in benzene and butadiene production. A new scheme for hydroxylamine production and a new technology for styrene and methanol production have been developed. Direct hydration of propylene has been introduced into the production of isopropanol and propylene ammonolysis has been used to obtain acrylonitrile. Changes in the plastics and synthetic resin industry include the use of high-efficiency catalysts, production of high- and low-density polyethylene by a new gas-phase process and emphasis on synthetic fibers, particularly polyesters. High-quality and more durable materials have been emphasized in the paint and varnish industry. Changes in the chemical industry have reduced energy consumption per production unit by 14.2% in the U.S.A. in 1977 in comparison with 1972 and by 14.0% in Common Market countries during 1970-1976. Tables 13; references 51: 5 Russian, 46 Western.
[10-9307]

CURRENT GOALS FOR THE GROWTH OF THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 5-12

KOSTANDOV, L. A.

[Abstract] The role of the chemical industry in the national economy, its growth over the past 15 years (1966-1980), the attainment of its goals for the tenth 5-year period, and its goals for the eleventh 5-year period are reviewed. Capital investments in the chemical industry, the construction of large chemical complexes and production have increased substantially. Goals for the tenth 5-year period were not met in several areas because of inadequate capital investment, ineffective use of available capital and facilities, and poor planning in relation to the availability of raw materials. Despite these deficiencies, advances in this field have saved 1.4 billion man-hours and up to millions of tons of raw materials (e.g., ferrous and nonferrous metals, wood and natural fibers). Problems to be solved in the eleventh 5-year period include increasing agricultural productivity (use of mineral fertilizers, chemical and biological protection agents for plants and animals), increasing the production of goods and their variety, conservation of natural mineral and timber resources, efficient use of manpower and energy, preservation of food products, and environmental protection (waste treatment, waste-free technology). A major problem is the development of new sources and new techniques for obtaining sulfur for use by the mineral fertilizer industry. Goals for the plastics industry include increased production of plastic building materials for agricultural use, expansion of production of new structural plastics (e.g., polycarbonates, polyacetals, polybutylene terephthalate, polysulfone) and plastic products for general use, and improvement in the quality of plastics. The use of chemical fibers in the textile industry and production of industrial fibers (e.g., semipermeable hollow fibers, heat-resistant fibers) should also be increased. Also discussed are the production of chemical additives, light and heat stabilizers and antioxidants, dyes and textile assistants, chemical and biochemical reagents, and household goods (detergents, paints and varnishes, aerosols). The greater involvement of eastern regions of the Soviet Union in the chemical industry and the need for more extensive mechanization are stressed. The institution of a complex regulatory system to improve the regulation, planning and management of economic aspects should increase the efficiency of this vital industry. The setting of more realistic goals based on economic and technical analysis is suggested. Table 1.

[85-9307]

PROBLEMS IN THE GROWTH OF PETROCHEMICAL COMPLEXES

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 13-16

AVDEYENKO, P. M.

[Abstract] The growth of the oil refining and petrochemical industry during the tenth 5-year period has been very rapid. Its fixed capital has increased by 4.9 billion rubles, its efficiency and quality of products have improved, and more large complexes have been built in areas close to consumers. The greater efficiency has produced a 25% drop in capital expenditures, and production has increased without a corresponding increase in the work force. Growth has been characterized by two major trends: the construction and setting into operation of highly productive consolidated plants for oil refining, catalytic reforming, fractionation, etc., and the combination of technical processes. The unification of technologically related processes into a combined automated system is highly economical, since it eliminates transport, storage facilities, additional labor, and reduces operation costs. A major problem has been the more efficient and more complete use of raw materials, e.g., refining of heavy oil fractions, production of ethylene by pyrolysis of liquid oil raw materials. Oil refining and petrochemical centers discussed include complexes at Kirishi, Achinsk, Nizhnekamsk (synthetic rubber, isoprene, vinyl, tires), Tobol'sk and Groznyy. The rise of these new petrochemical centers has had a positive regional socio-economic effect but has also created new problems: the need for a highly centralized and specialized repair and maintenance service, environmental protection and the use of waste products.

[85-9307]

PROBLEMS IN INCREASING THE LEVEL OF BRANCH PLANNING AND PRODUCTION EFFICIENCY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 21-27

VASIL'YEV, M. G., candidate of economic sciences, Planning and Economic Administration of the USSR Ministry of the Chemical Industry

[Abstract] Basic trends in improving planning and ways for increasing production efficiency in the chemical industry are reviewed. The structure of chemical enterprises (production of fertilizers, plant protection agents, chemical fodder additives and fodder preserving agents, plastics industry) should be optimized at the branch, subbranch and specific level with the use of economic-mathematical and computerized methods for regulation and management. Further mechanization of

production processes is required to increase productivity, while the work force is maintained at the same level, particularly since 60% of the work force is employed in auxiliary manual labor. Better management of raw materials distribution and use, more efficient use of energy resources, and better financial planning and analysis should increase efficiency and productivity. Table 1; references:

5 Russian.

[85-9307]

UDC 66.012.7(47+57)

PROBLEMS IN THE ECONOMIC EFFICIENCY OF THE USSR CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOUYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA

in Russian Vol 26, No 1, Jan-Feb 81 pp 27-32

SAVINSKIY, E. S., doctor of economic sciences, and LAZAREVA, O. S., Scientific Research Institute of Technical and Economic Research of the USSR Ministry of the Chemical Industry

[Abstract] General trends in the growth of branches of the chemical industry, especially the petrochemical industry, changes in its structure, and financial aspects are analyzed. The proportion of the production of the chemical industry in overall industrial production has increased from 3.8% in 1960 to 6.9% in 1979. A major factor in this growth has been the greater fixed capital and capital investments, both extensive, aiming to improve production with the use of existing technology, and intensive investments, aiming to introduce new or improved technology by using internal resources and cutting losses. Capital return for the entire industry changed from 1.57 (ruble/ruble) in 1960 to 1.18 in 1979. The structure of the chemical industry has also changed from 1966 to 1979: the proportion of the basic and mining chemistry branches increased together with capital and labor requirements, whereas that of other branches decreased. The use of funds can be made more efficient at three levels: design, construction, and management and use of new industrial plants. The time between the planning and setting into operation stages should also be shortened. The substantiation of the most efficient balance between expenditures and economic effect during the introduction of technical innovations and the search for an optimal way for achieving the economic effect, given limited equipment and machinery resources, are major goals. Tables 3; references: 8 Russian.

[85-9307]

SCIENTIFIC AND TECHNICAL PROGRESS AND ENERGY RESOURCES IN THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 33-38

BORISOVICH, G. F., candidate of economic sciences, Scientific Research Institute of
Technical and Economic Research of the USSR Ministry of the Chemical Industry

[Abstract] The chemical industry in the Soviet Union is one of the largest energy consumers. The chemical and petrochemical industry is fourth (63.6%) in expenditures for raw materials and third in the utilization of fuel-energy resources (heat, electricity, oil and other petrochemical products, coal). In the industry itself, the branches of basic chemistry, organic synthesis, chemical fibers and plastics and synthetic resins are the heaviest energy consumers. Although the Soviet Union is not experiencing an energy crisis, measures are needed to conserve liquid fuel and petrochemical hydrocarbon raw materials. Energy-efficient processes must be developed and by-products and wastes should be used. Processes currently used are characterized by low selectivity: about 35-70% of the raw materials are used. Greater emphasis has also been placed on coal processing, e.g., coal gasification and hydrogenation. Specific data are presented on the expenditure of raw materials for various products, use of energy of different industries, and world oil production and reserves. Tables 6; references 20: 18 Russian, 2 Western.
[85-9307]

UDC 66.338.92

PROBLEMS IN THE FORMULATION OF LONG-TERM PREDICTIONS FOR THE GROWTH OF THE PETROCHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 38-43

BRAGINSKIY, O. B., candidate of economic sciences, Laboratory of Methods and Models
for the Optimization of Industrial Planning, Central Economic-Mathematical Institute,
USSR Academy of Sciences

[Abstract] Various methods for long-term (20-year) predictions are described. The aim of prediction is to analyze a set of alternative variants for long-term growth and to select the optimal, to note future developments in industries, to determine the direction of research and to create a scientific basis for 5-year plans. A technical and economic prediction for the growth of the petrochemical industry consists of the following: A general description of the industry, its position in the oil refining and polymer-petrochemical industry and in the national economy,

scenarios for the growth of the industry during the specified period, prediction of raw material resources and a cost evaluation of different hydrocarbon raw materials, a technological prediction and a general prediction. Mathematical methods described include extrapolation, correlation analysis, structural correlations, standard prediction methods and selection of technical alternatives. A specific model for the last method is presented, which integrates local predictions to obtain the general prediction. References 22: 18 Russian, 4 Western.

[85-9307]

UDC 658.1

INTERRELATION OF LONG-TERM PLANNING AND PREDICTION WITH THE USE OF OPTIMIZATION CALCULATIONS IN THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 43-49

KRICHEVSKIY, I. Ye., doctor of economic sciences, Central Economic-Mathematical Institute, USSR Academy of Sciences

[Abstract] The types of planning are discussed: short-term (5-10 years) and long-term (15-25 years); these two approaches differ in their goals and in the mathematical methods used (extreme vs. simulation models). Optimization of short-term calculations for increases in production and distribution of chemical fibers over 5-10 years, long-term predictive calculations for determining the demand and production of chemical fibers over 15-25 years, and the correlation between optimization and prediction in the polymer-petrochemical industry for these periods are discussed. Factors considered in the analysis include supply of and demand for chemical fibers, their possible replacement by natural fibers, progress and developments in this industry, availability of raw materials (oil), competition from other industries for raw materials (e.g., plastics industry), capital and materials and labor costs. Table 1; references: 7 Russian.

[85-9307]

PROBLEMS IN PLANNING SCIENTIFIC INVESTIGATIONS IN THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 49-53

FEDOROV, K. G., candidate of economic sciences

[Abstract] Measures aimed at increasing the technical and economic substantiation of scientific research and experimental design work and the implementation of new procedures are analyzed with reference to current planning systems. The increase in supply orders for research (up to 9000) has made it difficult to correlate and manage effectively the various stages of research and has made it necessary to justify the research, to eliminate less relevant research by preplanning analysis and to determine and emphasize more relevant research. Basic trends in research in the chemical industry, which should constitute 60-80% of all chemical research, include the development of new catalysts and catalyst-based processes, new processes and innovations in equipment design, development of new products, environmental protection, and use of industrial wastes. Preplanning analysis should consider the type of work and the client, provisions for the work, expected implementation and effectiveness of the implementation, and financial analysis. The principle of multivariate aspects of planning with expert analysis of different variants is substantiated. A procedure for processing and analyzing planning documentation with the use of standardized forms and terminology and computers (correlation charts) is described. References: 7 Russian.

[85-9307]

UDC 66.01.044

CURRENT STATE AND PROSPECTS FOR INCREASING THE UTILIZATION OF RESOURCES IN THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 54-58

KAZARYAN, P. Ye., doctor of technical sciences, Scientific Research Institute of Technical and Economic Research of the USSR Ministry of the Chemical Industry

[Abstract] The efficient use of resources (machinery, equipment, automatic control units, etc.) by chemical industries (petrochemical, resin, plastics, chemical fibers, etc.) and factors affecting it in Western Europe, Japan, USA and USSR are analyzed. The decline in efficient resources utilization in the West and Japan has been primarily due to economic conditions, including inflation, and also to the

decrease in demand and greater pollution control requirements. A stable and high level of resources utilization, however, has been maintained in the USSR from 1971 to 1978 in the chemical fibers, plastics and synthetic resins, and paints industries. Technical and management factors affecting efficient resources utilization are deficiencies in equipment design, quality and operation; deterioration in the quality of raw materials and products; inefficient alteration of the production process structure; and poor management. The development of a methodology for formulating scientifically based quotas at the level of plants, industrial complexes and the industry as a whole; the use of computerized economic and mathematical methods for a comprehensive analysis of equipment failure; and precise information on equipment reliability should increase the production capacity of the USSR. The creation of production capacity reserves, which already exist in the West, is also a high-priority problem. Tables 7; references 17: 14 Russian, 3 Western.
[85-9307]

UDC 339.9:66

GROWTH OF FOREIGN ECONOMIC RELATIONS OF THE CHEMICAL INDUSTRY

Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA
in Russian Vol 26, No 1, Jan-Feb 81 pp 65-69

DEDOV, A. G., candidate of economic sciences, Scientific Research Institute of Technical and Economic Research

[Abstract] Foreign trade relations of the Soviet chemical industry and COMA members, the West and developing countries during the tenth 5-year period and basic trends and prospects for future developments are reviewed. Major export products (totalling 70%) were mineral fertilizers, inorganic chemicals and mining and chemical raw materials. Organic chemicals and polymers comprised 13%. Chemical products accounted for 40% of imports, plastics for about 20% and chemical fibers for about 5%. Joint projects sponsored by the USSR and COMA members included oil and gas pipelines, construction of factories and industrial complexes, international industrial organizations (e.g., Interkhim), cooperation among research institutes (e.g., sulfuric acid production, carbon conversion control, medical diagnostic paper), and specialization and cooperation in power-consuming and energy-efficient chemical processes. Cooperation of Soviet research institutes and major western chemical corporations (e.g., Hoechst, Ciba-Geigy, Bayer) is also discussed. Table 4; references: 5 Russian.
[85-9307]

COAL GASIFICATION

UDC (661.53+661.721)

PRODUCTION OF AMMONIA AND METHANOL FROM COAL

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 80 pp 43-45

IL'YENKO, B. K., Ukrainian SSR Academy of Sciences Institute of Gas

[Abstract] A survey is presented of the state of world industrial production and research developments in the area of the gasification of solid fuel for producing ammonia and methanol. Production processes for ammonia and methanol are today large consumers of natural gas. It is projected that it will soon be necessary in the USSR to use solid fuel as a raw material for the chemical industry. It is estimated that the Soviet Union has enough natural gas to last to the middle of the 21st century. In certain parts of the country, however, it might prove to be economically advisable to produce ammonia and methanol from coal. World data indicate that the percentage of ammonia produced on the basis of the gasification of coal is not greater than two percent. Approximately the same is true of methanol. It is projected that in 1985 the cost of methanol produced from natural gas at a cost of \$135 per 1000 m³ can prove to be eight percent higher than when producing it from coal. It is projected that in 1985-1990 in the USA coal will be able to compete economically with natural gas in the production of ammonia. The three modern processes for the gasification of coal which have been mastered by industry are discussed individually. These include the Lurgi, Winkler and Koppers-Totzek processes. These processes have been used both for producing fuel gas and synthesis gas. They differ in design of the apparatus, gasification conditions, i.e., temperature and pressure, the size of coal particles used and the nature of the movement of the coal in the producer and in the method of removing the ash. All three processes are used to produce ammonia. The Winkler process was mastered in Germany in the middle of the 20's. Gasification is carried out in units with a fluidized bed of coal particles measuring up to 1.5 mm at a pressure close to atmospheric, with the dry removal of ash. The Davy Powergas company has built 16 plants equipped with 36 Winkler gasifiers with these plants producing ammonia. The disadvantage of this process is its low pressure, which reduces the unit output of a gasifier and makes it necessary to clean dust from the gas with electrical filters instead of the more effective wet cleaning process employing Venturi scrubbers. Gasification by the Lurgi method is performed in units with a moving bed of coal particles measuring 1.5 to 50 mm in a countercurrent with a steam-oxygen mixture

with the dry removal of ash. The main disadvantage of this process is the high content of methane in the generator gas, i.e., from 12 to 16 percent. The economic efficiency of the process is reduced because of the cost of washing the generator gas with liquid nitrogen and then removing the methane. The Koppers-Totzek method for the gasification of coal is the most widely used one in the nitrogen industry. This process was developed in the 40's in Germany and the USA and makes it possible to process practically any kind of coal. The coal is processed in the form of dust at temperatures of 1500 to 1600° C and at a pressure close to atmospheric. Eighty percent of ammonia plants utilizing coal now operate with the Koppers-Totzek process. Its low pressure is its main disadvantage. The Shell-Totzek process now under development is intended to eliminate this disadvantage. This process will make it possible to process practically any kind of coal with an ash content of up to 40 percent and a sulfur content as high as eight percent. Two projects for the production of ammonia from coal based on the Texaco process are under development in the USA. References 16: 3 Russian, 13 Western.
[23-8831]

UDC 662.747

THEORETICAL BASES AND PROSPECTS FOR COAL GASIFICATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 23-31

FEDOSEYEV, S. D., Moscow Chemical and Technological Institute imeni D. I. Mendeleev

[Abstract] Methods of coal gasification presented include the pressure method of Lurgi in a dense layer of fuel at 20-30 atm, the Winkler method using fine grains of fuel in an air jet flow, and the pulverized torch method of Coppers and Totzek. Conversion of CO₂ and H₂O in contemporary gasification methods is at a low level, and various approaches to solving this problem are presented in calculations aimed at developing more efficient methods. Promising uses of catalysts and high temperature isothermal procedures are judged to be suitable for further research at the experimental production level. Figures 3, references: 5 Russian.
[33-12131]

TECHNICAL AND ECONOMIC BASIS FOR DEVELOPING NEW METHODS OF DEEP PROCESSING OF COALS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 61-66

YATROV, S. N., ZYKOV, V. M. and SPERANSKAYA, G. V., All-Union Scientific Research Institute for Complex Fuel and Energy Problems, USSR State Planning Committee (GOSPLAN)

[Abstract] Utilization of coal of the Kansk-Achinsk basin requires deep thermochemical processing through high-speed pyrolysis, hydrogenation and gasification, due to the special characteristics of the coals found in the basin. Physical and chemical properties of these coals are described. Despite negative features such as moisture content and high sulphur and ash levels, the extent of the deposits and the exhaustion of deposits in the European Soviet Union underline the need for mastering technology to improve the effectiveness of using these coals. Newly developed processes in the experimental production stage in the USSR are summarized. They include use of pulverized semi-coking coal, use of coal for electric power generation, and production of liquid motor fuels from cheap brown coal following West German patents. One diagram.

[33-12131]

COAL HYDROGENIZATION USING MODERATE HYDROGEN PRESSURE METHODS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 67-82

KRICHKO, A. A. and TITOVA, T. A., Institute of Combustible Minerals

[Abstract] Prospects for hydrogenation of coals of the Kansk-Achinsk basin using coals with sulphur content of 0.3-0.5% and 5-10% ash are summarized. The high molecular weight and difficulty of separation from coal that has not reacted when hydrogen pressure is not used indicate the need for developing processes such as the Gulf Oil SRC process and a similar Polish method, where 2-3% hydrogen is added under pressure. The addition of other organic compounds under moderate pressure (up to 100 atm) aids the reaction and blocks secondary condensing reactions. To determine optimal mixes, 3 hydrogenation cycles were tested. The results of these tests indicate that up to 3% hydrogen at pressures of up to 100 atm could be used to liquify coals of the Kansk-Achinsk basin without using petroleum products in the processes. Figures 3; tables 13; references: 3 Russian

[33-12131]

INVESTIGATION OF PRODUCTS OF LOW-TEMPERATURE CATALYTIC HYDROGENIZATION OF DONBAS COALS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 91-95

OSIPOV, A. M., OSIPOVA, K. D., CHERNYSHOVA, M. I. and PETRIK, G. K., Institute of Physical Organic Chemistry and Coal Chemistry, USSR Academy of Sciences

[Abstract] The relationship of the composition and properties of primary products of low-temperature hydrogenation is presented in relation to the nature of the coal, of catalysts, and of the conditions of hydrogenation. Temperature, the nature of the catalysts and of the type of coal used were directly related to the content of methane, ethane, propane, and CO₂, and of hydrogen sulphide in the case of brown and gaseous coals, as well as to the dissolving of hydrogenates and asphaltene content. The structural composition of components dissolved in methylene chloride was determined by proton magnetic resonance. Results of the experiments indicated that lead chloride was the most promising catalyst for low-temperature hydrogenation. Figure, tables 3, references 7: 2 Russian, 5 English.
[33-12131]

RECOVERY DEPOLYMERIZATION OF COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 83-90

BARANOV, S. N., KOCHANYAN, R. O. and NOSYREV, I. Ye., Institute of Physical Organic Chemistry and Coal Chemistry, USSR Academy of Sciences

[Abstract] The effects of the nature of coals and solvents, such as the dielectric constant and the chemical structure, are related to the dissolving of various coals in organic solvents such as benzene, tetrahydrofuran, and petroleum ether. At room temperature these solvents have little effect until N, N-dimethylacetamide or pyridine is added. Data on electron recovery of mineralized and demineralized coals were compared. The effects of the naphthalene and sodium ethylate anion radicals showed the predominance of electron transfer on aromatic coal structures, in comparison to the formation of anion centers at the expense of acid protons. The formation of graphite metal complexes and recovery of coals that cannot form metal complexes are discussed. The tests showed electron transfer from metal complexes are discussed. The tests showed electron transfer from metal to the electron-deficient systems of coal and the formation of anion radicals, the absorption of metals by highly metamorphized coals, and the deprotonization of proton-donor groups. The

level of depolymerization was studied using gel-penetration chromatography with tetrahydrofuran as the elutriator. This process showed that electron transfer was to condensed aromatic systems. Tables 8, references 5: 1 Russian, 1 Polish, 3 Western.
[33-12131]

PRODUCTION OF SYNTHETIC GAS FROM COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 3-7

CHERNENKOV, I. I., SHAFII, G. S. and NIKITINA, T. V.

[Abstract] Coal gasification projects, processes, facilities and capabilities of the United States, West Germany and the Soviet Union are surveyed. The Soviet Union presently has virtually no industrial coal gasification capability. Only the Institute of Fuels of the USSR Ministry of the Coal Industry on coal gasification and the planning department of VNIIPROMGAZ [All-Union Scientific Research Institute of Gas Utilization in the National Economy and of Underground Storage of Petroleum, Petroleum Products and Liquefied Gas] on in situ gasification are presently conducting scientific research on coal gasification. The USSR has plenty of oil and gas for the near-term future, and coal gasification is the solution to the problem of combatting pollution due to the use of low-grade coal in power engineering. Of special interest is the conversion of high-ash coal to fuel gas and the utilization of the ash for manufacturing building materials. Gasification in the USSR should be developed in two directions--the production of fuel gas from low-grade coal in European USSR, and the production of natural gas substitutes and technological gases from cheap Siberian coal. The institute has developed a new high-rate gasification process, which utilizes a fluidized bed under pressure with high-temperature gas purification to remove dust and sulfur compounds. The rate of one gas generator is 3-3.5 times higher than has been achieved in the modern Lurgi gas generator. The removal of hydrogen sulfide from the gasification products is considerably simpler than the purification of stack gases to remove sulfur oxides. The gasification products can be used in gas turbine installations. Work is presently under way on the construction and adoption of a plant for producing fuel gas from different kinds of fuels at a pressure of up to 30 atm. Two 360 nm³/hr compressors have been installed for supplying the plant with compressed air. The grate for the fluidized bed was developed in cooperation with the department of processes and reactors of the Moscow Institute of Precision Chemical Technology imeni M. V. Lomonosov. Studies were conducted in laboratory reactors on the fluidized bed gasification of high-ash coal under pressure. The coal required much greater blowing than is necessary for binding the carbon in the fuel because of the large amount of ash in the coal. The suitability of the high-ash "Elibastuzskiy"

coal for gasification for the purpose of producing fuel gas can be judged only after experiments are conducted at an experimental plant. Tables 1; references 8: 1 Russian, 3 Western.
[64-7872]

PLASMA COAL GASIFICATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 34-38

KRUZHILIN, G. I., KHUDYAKOV, G. N. and TSELISHCHEV, P. A.

[Abstract] In the interest of environmental safety in connection with the utilization of low-grade Siberian coal, preliminary processing of fuel is investigated in order to remove pollutants and to improve its technological quality by reducing the ash and moisture content. This also solves the problem of transportation of Siberian energy resources to the European section. The coal is gasified to produce high-caloric gas or liquid fuel, suitable for energy and technological utilization and convenient for long-distance pipeline or railroad transport. The coal is gasified with a low-temperature oxidant plasma consisting of steam and oxygen. The reaction products in thermodynamic equilibrium consist of CO, H₂ and H₂S. The products contain nitrogen in accordance with its content in the fossil fuel, and other trace impurities. The experiment was conducted in a steam-oxygen blown gas generator with a 1,000-ton per hour pulverized coal fire box. The efficiency of the flame gasification process is about 45%. The authors calculated the plasma gasification of 1 ton of dry Irsha-Borodinskiy coal from the Kansk-Achinsk field. The plasmotron efficiency was 97%. The plasma method of producing hydrogen is 3.38 times more effective than electrolysis in terms of efficiency and 26 times more effective in terms of money. It is also feasible to produce high-caloric liquid hydrogen fuels such as liquid methyl fuel and NH₃, which are suitable both for power engineering and for transportation and are also convenient for railroad transportation. Tables 1; references: 11 Russian.
[64-7872]

STRUCTURE AND MOLECULAR INTERACTIONS IN COAL AND THEIR INFLUENCE ON
CONVERSION PROCESSES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 92-98

RUS'YANOVA, N. D. and POPOV, V. K.

[Abstract] Three fundamentally different models are proposed to explain how aromatic, hydroaromatic, heterocyclic and aliphatic fragments interact, in what ratio they exist and whether they retain their individuality. All the models fail to explain certain principles and features, noticed when the degree of metamorphism changes. The absorption spectra of coal in ultraviolet, visible and near-IR ranges are examined. These spectra show a broad peak, the position of which depends on the stage of metamorphism. Coal is viewed as a high-molecular compound, in which sections with the π - π conjugation system alternate with sections without effective conjugation. Macromolecules in which polyconjugate systems predominate are more stable and inclined to the formation of donor-acceptor associates and to better ordering. Delocalization of electrons and paramagnetism can occur. Structures of this type can exhibit catalytic properties. Three abrupt changes in the properties of coal are examined. They are the appearance of caking capacity, the attainment of maximum caking capacity and solubility, and the disappearance of caking capacity and the capacity to change to the dissolved state. Compounds with conjugate and hydrogen bonds promote reactions that lead to the perfection of a conjugation system and promote a reduction of bridges between sections with conjugate bonds. Donor-acceptor interaction and hydrogen bonds not only affect coal conversion processes, but they also reduce the solubility of the conversion products. The best raw material for producing high-yield liquid products is coal in which there is a relatively low concentration of heteroatoms and structures with a developed polyconjugation system. Coal of this kind also has the maximum capacity to accept leaching additives. Figures 4; references 22: 8 Russian, 14 Western. [64-7872]

INVESTIGATION OF A HIGH TEMPERATURE FUEL ELEMENT

Moscow ZHURNAL FIZICHESKOY KHMII in Russian Vol 55, No 2, Feb 81 pp 491-493
manuscript received 27 Mar 80

SOFRONKOV, A. N., MEZENTSEV, I. S. and TERLETSKAYA, T. Z., Odessa Technological
Institute imeni M. V. Lomonosov

[Abstract] Electrooxidation of the fuel gas mixture $\text{CO} + \text{CO}_2 + \text{H}_2$ was studied in an element whose electrodes contained no precious metals. Lithium and sodium carbonates with an admixture of high melting metals were used to prepare the electrolytes. The fuel electrodes were prepared from the following metal powders: Fe, Ni, Cu, Co and Mo; an oxygen electrode was made from copper oxide. The electrooxidation rate of the gaseous mixture depended on its composition, on its reaction temperature and on the metal in the fuel electrode. The metals showed the following order of activity in electrooxidation of $\text{CO} + \text{H}_2 + \text{CO}_2$ mixtures: $\text{Pt} > \text{Fe} > \text{Ni} > \text{Co} > \text{Cu} > \text{Cr} > \text{Mo}$. Figures 3; references: 2 Russian.
[91-7813]

FERTILIZERS

UDC 66.099.2:537.212

APPARATUS FOR GRANULATION OF MINERAL FERTILIZERS IN A PSEUDO-FLUIDIZED BED USING AN ELECTROSTATIC FIELD

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 9, Sep 80 pp 556-557

KOKIN, A. S., POPOV, B. G. and BOYARSHINOV, A. V.

[Abstract] The design and operating principle of an apparatus for granulation of mineral fertilizers in a pseudo-fluidized bed using an electrostatic field were developed with regard to the advantages of electron-ion technology. In passing through the region of the corona, the granules acquire a charge whose sign is determined by the sign of the potential on the coronizing electrode. The greater the charge of the particles, the greater the force moving the granules and the greater the distance the granules move. Coagulation of the granules is reduced, the air flow is improved and the intensity of heat and mass transfer is enhanced as the distance between granules is increased. The electric attractive force of the screen whose charge is opposite the charge of the granules also acts on the granules. The aerodynamic force acting on spherical granules is directed opposite the electrostatic field forces. The electric forces acting on the granules are five orders greater than the aerodynamic forces. This permits a flow rate of the fluidizing agent to be increased somewhat compared to apparatus in which there is no electrostatic field and the granulation process can be intensified and the drift of the granules can be reduced. These factors result in an increase of productivity of the apparatus and a reduction of the overall dimensions with high economic effectiveness.

[46-6521]

OPTIMIZATION OF CONTROL OF THE SYNTHESIS GAS PREPARATION SECTION OF THE AM-600 AMMONIA PRODUCTION PLANT

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 5, Sep-Oct 80 pp 7-10 manuscript received 22 Feb 80

BADIKOV, I. D., MANDRUSENKO, G. I., MIKHAYLOVA, L. A. and KIYASHKO, A. P.,
Experimental Design Bureau for Automation Severodonetsk Branch

[Abstract] The problem of the optimal control of the synthesis gas preparation section of an ammonia production plant is formulated and solved for the purpose of maintaining optimal operating conditions when using an ASU TP [automated control system for a technological process]. A simplified technological diagram of the synthesis gas preparation section is shown. Compressed natural gas, after being heated in the heat exchanger of a heat utilization unit, enters desulfuration units in which sulfur compounds are hydrogenated by the hydrogen of a nitrogen and hydrogen mixture dispensed into the stream of natural gas, and in which hydrogen sulfide is absorbed. The clean natural gas is mixed with saturated water vapor and after heating is delivered to a pipe still. The heat utilization unit also contains heat exchangers for superheating steam and heating the boiler water and air, and a waste-heat boiler. Fuel, i.e., natural gas, is burned to carry out the first-stage methane conversion process. The converted gas from the pipe still is sent to a secondary-reforming shaft converter in which the residual methane is converted with technological air. The converted gas is cooled in waste-heat boilers and a heat exchanger and is then subjected to first-stage conversion of carbon monoxide. Humidifiers are employed to maintain the required moisture content in the gas. After cooling in the waste-heat boiler, the converted gas is subjected to second-stage conversion of carbon monoxide and is cleaned of carbon dioxide in an absorber. The converted gas is then heated in heat exchangers and enters a methanator to be catalytically cleaned of oxygen-containing impurities. The purified converted gas is then compressed and enters the circulation cycle of the ammonia synthesis section. Serving as the optimality criterion is the variable component of the production cost of 1000 nm^3 of synthesis gas. For a prescribed state of the system, \bar{X} , are calculated control effects, \bar{U} , ensuring the minimum of the optimality criterion, i.e., $R = \min_{\bar{U}} (\bar{X}, Y, \bar{U})$, where Y is the output variable.

Selected as control effects are U_1 —the ratio of vapor to gas in the inlet to unit N101 [not defined], U_2 —the temperature of the converted gas in the outlet of unit N101; U_3 and U_4 —the temperature of the converted gas in the inlet to the carbon monoxide converter, stages one and two, respectively; and U_5 and U_6 —the rate of flow of condensate to the humidifiers. An equation is presented for the optimality criterion, derived on the basis of material balance equations: $R = (1000/G \text{ kg}) \cdot [(0.019(1 + K_t) + 9.95 \cdot 10^{-4} + 2.22 \cdot 10^{-3} K_v)W + Q_{ov} \cdot 0.26 - Q_{1zb} \cdot 3.64]$. Here

$Q_{1zb} = Q_{dg} + Q_{kg} + 1.56W - Q_p$; $Q_{ov} = Q_{1zb} + 1.14W$; Q_{kg} is the flow rate of converted gas in nm^3/h ; K_t and K_v represent the ratio of fuel and air supplied to the shaft converter to the load in terms of natural gas; 0.019 represents the cost of natural gas in rubles/ nm^3 ; $9.95 \cdot 10^{-4}$ and $2.22 \cdot 10^{-3}$ represent the specific cost of compressing natural gas and air in rubles/ nm^3 ; W is the natural gas load in nm^3/h ; 1.14 is the steam consumption factor for reaction with the natural gas in tons/ nm^3 ; 0.26 and 3.64 represent the cost of desalted water and steam in rubles/ton; Q_{dg} and Q_{kg} represent the amount of steam removed from smoke and converter gas in tons/h; Q_p represents the steam load to the pipe still in tons/h; and 1.56 is a factor taking into account the formation of steam in the synthesis section per unit of natural gas load in tons/ nm^3 . Q_{ov} represents the quantity of desalted water and Q_{1zb} of excess steam. The optimal control problem includes performing the steps of correcting values of parameters U_1 and U_2 , adaptation of the model to a real system and calculating and printing out optimal values of control effects. A flowchart is given for the algorithm for solving the optimal control problem and the results of solving the problem are presented in tabular and graphic form. The optimal control system described was tested at the Cherkassy "Azot" [Nitrogen] Production Association and is to be put into service there in 1980. Figures 3.

[23-8831]

UDC 661.53.001.2

STUDY OF THE COOLING PROCESS OF CIRCULATING GAS IN THE EVAPORATOR OF ABSORPTION-TYPE COOLING UNITS OF A LARGE-UNIT-CAPACITY AMMONIA SYNTHESIS PLANT

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 80 pp 3-7 manuscript received 9 Jul 79

YEFIMOV, V. T., BABICHENKO, A. K. and YEROSHCHENKOV, S. A., Khar'kov Polytechnical Institute

[Abstract] Ammonia is produced by standard plants with a capacity of 1360 tons per 24-hour period and having a two-stage circuit for condensing the ammonia and circulating gas. In the second stage condensation is performed by cooling in two ammonia evaporators which operate in parallel. To one of these is connected a turbocompression cooling unit, and to the other two absorption-type cooling units, AKhU-(-10)'s, in parallel. An ammonia synthesis plant operates more efficiently, the lower the temperature for secondary condensation. This temperature, however, varies constantly because the temperature of the circulating gas at the evaporator's outlet varies over the range of -10 to +12°C. This is caused by the fact that in the second evaporator considerable fluctuations take place in the pressure and concentration of the ammonia which boils in it, and these fluctuations in turn

determine its boiling point. The liquid ammonia evaporator has a direct influence on the cooling temperature of the circulating gas and the operation of this evaporator depends on harmonious operation of the cooling unit as a whole and on its thermal load. The results are given here of investigations conducted for the purpose of determining the feasibility of lowering the secondary condensation temperature under industrial conditions by improving the cooling process in an AKhU-(-10) evaporator, and of determining the quantitative relationships between the operating parameters of the absorption-type cooling unit (AKhU) and the evaporator. Studies were conducted by the mathematical modeling method. The evaporator is in the form of a jacket-surrounded pipe-type heat exchanger with U-shaped pipes in the space between which the liquid ammonia boils. A system of equations is derived for a mathematical description of an AKhU-(-10) evaporator. The mathematical description was checked for accuracy by comparison with experimental data on the AKhU-(-10) evaporator at the Severodonetsk "Azot" [Nitrogen] Production Association. The error was not greater than eight percent. The mathematical description makes it possible to determine the dynamic characteristics and the quantitative influence of various parameters on the process of cooling the circulating gas. A discussion is presented of the dependence of the temperature of this cooling process on the amount of reflux drained and on the concentration of ammonia at the evaporator's inlet, two factors which have the greatest effect in considerably disturbing the cooling process. Experimental data demonstrate that with a 0.01 kg/kg increase in the concentration of liquid ammonia entering the evaporator the concentration of ammonia boiling in the evaporator increases by 0.0484 kg/kg. To accomplish this it is necessary to reduce the flowrate of reflux by 0.0515 kg/s and to increase the discharge of ammonia vapors by the same quantity to ensure constant pressure in the evaporator. The boiling point of the ammonia is then reduced by 1.98°C and the temperature of the cooled circulating gas by 1.64°C. To accomplish all this it is necessary to increase the frequency of circulation. Reducing the cooling temperature of the circulating gas under industrial conditions requires regulating the flow of drained reflux and of liquid and vaporous ammonia in the AKhU. The existing automatic regulation system is inadequate for this purpose. It does not make it possible to achieve the main goal of the maximum possible degree of cooling of the circulating gas. Figures 4; references: 12 Russian.

[23-8831]

QUALITY CONTROL OF LIQUID AMMONIA FOR EXPORT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 pp 34-36

ALEKSEYEV, A. M., ALIPOV, N. Ye., RABINA, P. D., TALALAYEV, B. M.,
PETRAKOVICH, V. Ye., ROZENBERG, M. Sh., MORGUNOVA, Ye. T., KOPCHENOVA, Ye. V. and
KOSTIKOVA, Yu. I.

[Abstract] Because of a considerable increase in the exportation of liquid ammonia, new requirements, "Liquid ammonia for export", were developed, including product quality indices. Preliminary sampling principles and techniques were developed, analysis methods were adopted, perfected and introduced at plants, and work was done on improvement of the quality of ammonia. A liquid ammonia sampling setup was designed on the basis of materials provided by foreign companies. Correction factors for evaporation during sampling were worked out. Metal cylinders for sampling, which should substantially facilitate and improve the safety of sampling, are being tested. Tests were carried out on the accumulation and generalization of statistical ammonia quality control data for the purpose of comparing data on the content of impurities by international standards and GOST procedures. The international standards procedure, which uses ethylene glycol to absorb moisture, is found to be more sensitive than the GOST procedure. The technical specifications for determining moisture content to up to 0.15% by weight recommend the Fisher method, and for higher concentrations the Lysenko method. Water in the concentration of 0.2% by weight is sprayed into the liquid ammonia before being pumped into the ammonia pipe in order to inhibit the corrosion cracking of steel that occurs when oxygen gets into the ammonia. A comparison of the GOST and international standards procedures for analyzing the oil content in liquid ammonia disclosed that the international standards procedure gives 10-20% overstated results in comparison with GOST, which uses ultraviolet spectroscopy. The iron concentration is determined by photocolormetry with sulfosalicylic acid. The concentration of iron in liquid ammonia for export from plants near ports is substantially lower than standard. The total chlorine concentration is not supposed to exceed 0.5 parts per million and is determined by visual nephelometry. Eudiometry is used for analyzing dissolved gasses. The dissolved gas concentration in ammonia does not exceed 0.2% by volume. The concentration of CO_2 in export ammonia was determined strictly by the international standards procedure. CO_2 present in liquid ammonia is absorbed with 0.1 N aqueous solution of $\text{Ba}(\text{OH})_2$ and the solution that remains free of barium hydroxide solution is titrated with sulfuric acid. This procedure was modified and improved, and tests showed that the CO_2 concentration does not exceed 30-40 parts per million. However, some plants greatly exceed that standard and much work remains to be done. Figures 1; references: 2 Western.

[61-7872]

FUELS

UDC 661.721

CURRENT STATE OF THE ART OF THE PROBLEM OF METHANOL SYNTHESIS (METHANOL AS AN ENERGY CARRIER AND CHEMICAL RAW MATERIAL)

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 6, Nov-Dec 80 pp 3-13

GAMBURG, D. Yu. and SEMENOV, V. P.

[Abstract] The use of methanol as a chemical raw material and as a material for microbiological synthesis, a fuel for internal combustion engines and an energy fuel is surveyed. The history of methanol development as a fuel from its use for heating and lighting in Europe in the 1830s to its current popularity as an automotive and heating fuel is discussed. The various engineering solutions for systems to synthesize methanol include the use of effective catalysts, compression and pumping devices and the energetics of the process. The prospects of producing methanol from coal are studied. Investigations are under way to produce gasoline with octane rating of 90-100 from methanol using zeolites as conversion catalysts. Methanol can be synthesized from coal in a three-phase reactor and by electrolysis. Methanol production from coal has been shown to be economically competitive with other types of fuel production. Methanol has changed from a product designated primarily for the needs of the chemical industry prior to 1975 to use as a motor and power engineering fuel. Methanol has also been studied as a raw material for biological methods of synthetic feed protein production. The food additive for cattle is produced by biological synthesis of protein from methanol and a corresponding bacteria culture. References 42: 11 Russian, 31 Western.

[50-6521]

RESULTS OF THE ALL-UNION CONFERENCE ON THE CHEMISTRY AND TECHNOLOGY OF SYNTHETIC FUELS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 3-8

KRICHKO, A. A., Institute of Mineral Fuels

[Abstract] The All-Union Conference on the Chemistry and Technology of Obtaining Liquid and Gaseous Fuels from Coal, Shale and Petroleum Residues, held in September, 1979, was attended by representatives of leading governmental and research institutions from the Soviet Union. Experimental and model production, as well as normal production operations to obtain synthetic fuels were described as efforts are intensified to replace oil and natural gas with other sources of energy, particularly synthetic fuels, increase coal production, and implement cost-effective procedures for coal gasification and the utilization of oil shales. Hydrocarbon raw materials are needed both for motor fuels and for chemical uses due to the declining world reserves of petroleum and the inaccessibility of Soviet oil. Advances in hydrogenization and depolymerization both in the USSR and abroad were described at the conference. The conference papers underlined the need for expanding scientific research and cooperation and developing test production at a more intensive pace.

[33-12131]

PROSPECTS FOR DEVELOPING THE PRODUCTION OF SYNTHETIC FUELS IN THE USSR AND ABROAD

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 9-22

KALECHITS, I. V., USSR State Committee on Science and Technology

[Abstract] The history of rising use of petroleum in the face of finite oil reserves is presented. Soviet efforts to utilize coal while filtering sulphur pollution, foreign and domestic methods for obtaining liquid synthetic fuels using catalytic processes, and other approaches to gasification are described. Methods developed so far, largely in West Germany and the United States, are regarded as not practicable due to high cost. Better prospects are foreseen in processes that will bring the conversion of carbon monoxide without heating under pressure, and catalysts for direct ethylene synthesis. Thermal processes for semi-coking of shales and coals, and pyrolysis of pulverized coal, are also summarized. References 47: 7 Russian, 40 Western.

[33-12131]

ECONOMIC PROBLEMS OF FUEL PRODUCTION IN THERMIC PROCESSING OF BALTIC COMBUSTIBLE SHALES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 32-35

MASHIN, V. N., PIYK, E. E. and KRET, V. V., Scientific Research Institute for Shales

[Abstract] Shale processing to obtain liquid and gaseous fuels in the USSR has been concentrated in the Leningrad and Estonian SSR regions; such production goes back 50 years in the latter region. Technical requirements and advances in production of compounds with high oxygen content and phenols are summarized. Economic and technical factors brought reduction in production in the 1960s. Recently improved efficiency and rising oil prices have made the fuels produced at these facilities competitive once more, but antiquated kilns should be phased out of service. Figures 2.

[33-12131]

ECONOMIC PRODUCTION INDICATORS AND THE EFFECTIVENESS OF USING SYNTHETIC FUELS PRODUCED FROM COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 36-41

KRAPCHIN, I. P., DAVYDOV, V. P., KIRSANOVA, O. P., KOROL'KOVA, O. M. and SLIPCHENKO, E. S., Institute of Combustible Minerals

[Abstract] The exhaustion of petroleum deposits in the traditional sources of the Urals, the trans-Volga region, the northern Caucasus and the trans-Caucasian fields increase the need for developing processes to obtain synthetic liquid fuels from coal. Western processes for hydrogenization at low pressures and with low hydrogen utilization are regarded favorably for processing brown coal. Industrial gasification projects are under way in the Moscow region and the Kansk-Achinsk basin. Synthetic gaseous fuels from coal are being produced in subterranean factories in the Uzbek SSR and the Kuznets basin. Solid synthetic fuels are also being produced for both powder and stratum burning systems. Tables 6.

[33-12131]

ECONOMIC CONDITIONS FOR THE DEVELOPMENT OF SYNTHETIC FUEL PRODUCTION FROM COAL
IN A LONG-RANGE PERSPECTIVE

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 42-48

ARSKIY, A. K., Institute of World Economics and International Relations,
USSR Academy of Sciences

[Abstract] Production costs for synthetic fuels from cheap coal are lower than such alternatives as producing methanol using coal as a carbon source only, or using solar energy and coal for hydrocarbons to produce methanol. Projects for producing gas from coal using the Lurgi process in the United States are summarized, and environmental requirements are presented. Utilization of shale and of bituminous sands becomes more competitive as oil prices on world markets increase, and consequently development of synthetic petroleum production from coal is indicated as an important goal for Soviet energy planning. Figure 1, references 8: 2 Russian, 6 English.

[33-12131]

PROSPECTS AND TECHNICAL AND ECONOMIC EVALUATION OF METHODS FOR OBTAINING
SYNTHETIC LIQUID FUEL FROM COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 49-56

SHLIKHTER, E. B., KHOR'KOV, A. V. and ZHOROV, Yu. M., Central Economic Mathematics Institute, USSR Academy of Sciences, Ministry of Petroleum, Chemical and Fuel Industries

[Abstract] Rising oil prices and the exhaustion of cheap organic fuels point to the need for chemical processing of coal to obtain synthetic liquid fuels. Added importance for such development in the USSR is dictated by the remote location of many coal deposits, such as the Kansk-Achinsk basin. Methods for synthesizing that are described include thermal dissolving in a hydrogen donor solvent, hydrogenation, and gasification with subsequent synthesis and pyrolysis. The need for improved technology is stressed. Cost factors are related to the chemical process involved, rather than to losses in fuel quantities, and the methanol produced is readily transported by pipeline. It can then be used for both gasoline and diesel fuels. Tables 2, references 12: 3 Russian, 9 English.

[33-12131]

PREMISES FOR THE SELECTION OF THE OPTIMAL STRUCTURE FOR A PLAN FOR SEPARATING LIQUID PRODUCTS OF THE CHEMICAL PROCESSING OF SOLID FUELS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 96-101

ZYKOV, D. D., KULAGINA, L. A. and BUGROV, Yu. M., Moscow Institute of Chemical Machine Construction

[Abstract] The synthesis of processing plans for chemical processing of solid fuels is analyzed to define various systems and compare them. Qualitative data on such properties as molecular mass, the relation of vapor elasticity to temperature, density and viscosity, as well as other chemical and physical properties, are considered in the analyses. The key factor was shown to be the true boiling point temperature, and subsequent evaporation. A theoretical discussion of factors involved in these separating systems is presented. Figures 4; references:

3 Russian.

[33-12131]

THERMAL DISSOLVING OF COMBUSTIBLE SHALES AND COALS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 102-107

VOL'-EPSHTEYN, A. B., SPIL'BERG, M. B., BREGADZE, T. A., and GORLOV, Ye. G., Institute of Combustible Minerals

[Abstract] Promising technology, cheap and suitable raw material and cost effectiveness are considered for methods of thermal dissolving of hard and brown coals and enriched shales from hard coal of the Krasnoorlovskiy layer, brown Irsha-Borodinskiy deposit coal from the Kansk-Achinsk basin, enriched Baltic shale and sulphurous shale from the Kamelik-Chaganskiy deposit of the Volga basin. Characteristics of these minerals and steps in the testing are described. Results showed that certain additives prevented coke-like deposits on the walls of the apparatus used and increased the solvency of the coal, reduced gas formation, and enhanced homogeneity of the liquid fuel obtained. The residue-free extracts and mixtures using them with solid components could be used as bonding agents for road building, for electrode coke, and for bonding in pelleting, while the solid residue could be used for power producing fuel and for gasification. The methods used are ready for comprehensive testing. Tables 6, references 4: 3 Russian, 1 German.

[33-12131]

LOW-TEMPERATURE HYDROGENATION AND CONVERSION OF COMBUSTIBLE SHALES AS METHODS FOR INVESTIGATING THEIR STRUCTURE AND OBTAINING LIQUID PRODUCTS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 108-115

KLESMENT, I. R., HAPPA, L. A. and UROV, K. E., Chemical Institute of the ESSR Academy of Sciences

[Abstract] The high mineral content of combustible shales complicates use of thermal dissolving methods that can be used with hard coals; approaches to solve the problem described in this study include catalytic hydrogenation using ammonium molybdate and 1% mole of kerogen, with an initial pressure of 25-50 atm, with and without a cyclohexane solvent; thermal dissolving in the presence of cyclohexane; and conversion in an aqueous solution of formate and sodium hydroxide. Various shales were tested, including Estonian kukersit obtained by flotation, Bulgarian combustible shales from the Mandra deposit, and Estonian dictyonemous shale. Results showed that both shales in an aqueous suspension formed less tar than during semi-coking, while adding formate brought insignificant increases in tar. Low hydrogen content and high content of heterogenous elements contributed to the high aroma of the tar. Catalytic hydrogenation with an organic solvent or conversion with water were judged to be promising methods for processing shales that were low in organic substances. Figures 3, tables 5, references 18: 10 Russian, 8 Western. [33-12131]

A COMPREHENSIVE SYSTEM FOR PROCESSING SULPHUROUS MAZUT

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 116-121

VARFOLOMEYEV, D. F., FRYAZINOV, V. V., BERG, G. A., SLUTSKAYA, S. M., BORISOVA, N. S. and KALINCHEVA, L. A., Bashkir Scientific Research Institute for Petroleum Processing

[Abstract] New technological needs in processing special types of petroleum coke are discussed from the viewpoint of improved sorting, transport, and processing of low-sulphur oils available in western Siberia, and also of the developing new systems for obtaining electrode coke from sulphurous oil. The new systems for obtaining mazut from various types of petroleum include fractionation in a temperature range of 180-580°C using various procedures. The fractions received and capital investment needs for variants of the systems are summarized. High-cost products were obtained most effectively from west-Siberian oils using vacuum distillate pyrolysis. Diagrams 3; 1 table. [33-12131]

KINETIC CHARACTERISTICS OF THE PYROLYSIS OF HEAVY CRUDE OIL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 122-127

SAMOYLOV, A. S., KUROCHKIN, A. P., PUL'KINA, M. K. and BERDOVA, N. N.,
State Scientific Research Institute imeni G. M. Krzhizhanovskiy

[Abstract] Pyrolysis of heavy crude oil yields gaseous, liquid and solid products whose chemical composition and value are analyzed on the basis of Arlanskaya Petroleum and directly distilled Arlanskaya mazut. Tests were conducted on laboratory equipment with a solid heater in a dense immobile layer in the temperature range of 660-905° C for 0.08 - 0.2 seconds, and with a falling gas suspension method at temperatures of 680-805° C for 0.7-2.4 seconds. Ideal features of equipment and the course of the tests are described. The length of reaction time was found to be a key factor in benzene yield, with best results at about 1 second. Temperature increases brought reduced ethylene yields, as well as decreased quantities of paraffin and naphthene hydrocarbons. The distribution of sulphurous compounds depended on the composition of the original raw material. Figure 1, tables 2, references 9: 7 Russian, 2 English.

[33-12131]

HYDRODESULPHURIZATION OF PETROLEUM RESIDUES WITH PRELIMINARY HYDRODEMETALLIZATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, 1980 pp 128-131

VAYL', Yu. K., MANSHILIN, V. V., LIPKIND, B. A., AGAFONOV, A. V. and KNYAZEV, V. S.,
All-Union Scientific Research Institute for Petroleum Processing

[Abstract] Direct hydrodesulphurization in stationary and three-phase layers were tested to determine yields of low-ash and low-sulphur coke, raw material for catalytic cracking and low-sulphur boiler fuel. The presence of asphalt and tar substances in sulphur compounds deactivates the catalysts quickly and brings the need for high pressure methods; production testing was conducted to find solutions to these problems. Deposits of such heavy metals as vanadium, nickel and iron from the petroleum residues were determined to be the cause for loss of effectiveness of the catalysts, indicating the need to eliminate those metals prior to desulphurization. Low-cost catalysts were also developed at the institute. Tables 4.

[33-12131]

PRODUCTION, DISTRIBUTION AND USE OF SYNTHETIC GAS AND ENVIRONMENTAL PROBLEMS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 132-140

LAVROV, N. V., All-Union Scientific Research Institute for Industrial Gas

[Abstract] Synthetic gas production is discussed in terms of gasification of solid fuels, including theoretical principles and the current state of technology, production of gases with varying burning temperatures from 1600 to 7500 kilocalories per cubic meter, and specific composition of gases. Western developments as well as Soviet methods are summarized. Use of pulverized coals, gasification under pressure, and complex processes, have gained importance in Soviet energy plans. Harmful sulphurous and other emissions, pyrolysis of organic fuel, and industrial development of synthetic gases are described. Tables 2, references: 8 Russian [33-12131]

EXPANSION OF ENERGY RESOURCES IN THE USSR

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 141-146

FAUSHKIN, Ya. M., Institute of Combustible Minerals

[Abstract] The history of utilization of local energy deposits since 1925 is presented, with emphasis on plant products such as wood, scrap lumber, agricultural and municipal wastes. Synthetic fuels thus generated have been used for stationary engines and for off-the-road vehicles. The abundance of petroleum products brought declines in these gas generation operations, but rising petroleum prices make them once more cost-efficient, for carburetor engines and diesels that can operate with gaseous fuel, for river vessels, and for preliminary gasification to be followed by removal of harmful emissions. Other forms of gasification, developed in the 1960s and 1970s are summarized, and nuclear, solar and renewable energy sources are mentioned. References 5: 4 Russian, 1 German. [33-12131]

TECHNICAL AND ECONOMIC INDICATORS OF HYDROCARBON SYNTHESIS FROM CARBON MONOXIDE AND STEAM

Moscow KIMIYA TVERDOGO TOPLIVA in Russian No 6, Nov-Dec 80 pp 147-149

KRAVTSOV, A. V., KRASNYATOVA, G. F., PATRAKOV, Yu. F., KHUDRYAKOV, A. Ye., EPEL', S. A. and DNEPROVSKIY, S. N., Tomsk Polytechnical Institute imeni S. M. Kirov

[Abstract] Although Soviet oil and gas reserves are major, growing demand indicates the need for providing part of Soviet needs with synthetic fuel production from coals, combustible shale, sands and other unconventional raw materials. The production of $\text{CO} + \text{H}_2\text{O}$ on a stationary bed catalyst was accomplished using waste gases. Capital investments and relative cost (70 rubles per ton) were only 40% of those at the Novochoerkassk Synthetic Fuel Plant. Figures 3, tables 3, references 10: 8 Russian, 2 English.

[33-12131]

UDC 662.758:629.113

PROBLEMS AND PROSPECTS OF USING EMULSIFIED FUEL

Moscow KIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 80 pp 18-20

ROBUSTOV, V. V., Siberian Highway Institute imeni V. V. Kuybyshev

[Abstract] The advantages of shifting internal combustion engines to emulsified fuel (water-fuel emulsions), such as fuel economy, reduction of atmospheric pollution, decrease in fuel toxicity, are offset by the technical problems in the economic production of emulsified fuel and in altering engine design for efficient utilization of this fuel. Emulsified diesel fuel has a lower cetane number and longer ignition delay, but combustion of emulsion droplets and the effect of chemical factors on combustion increase heat production and reduce combustion time. Running a D-37M diesel engine on emulsified fuel with 10 and 15% water showed that the lower water content was more effective; nitrogen oxide and carbon monoxide levels in emissions were reduced. The variety of surfactants and their combinations used in making fuel emulsions indicates the absence of a suitable surfactant for producing stable emulsions. Addition of 0.20-0.25% surfactant is recommended. Filters made of a nickel grid with a twill weave are recommended for fuel emulsion purification. Figures 1; references 9: 7 Russian, 2 Western.

[43-9307]

ANTIOXIDANTS FOR HYDROGENATED JET FUELS

Moscow NEFTEKHIMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 895-900
manuscript received 10 Jan 80

VISHNYAKOVA, T. P. and GOLUBEVA, I. A., Moscow Institute of the Petrochemical and Gas Industry imeni I. M. Gubkin

[Abstract] Approximately 500 antioxidants of various types, some metal deactivators and dispersing additives were investigated as additives which increase the thermo-oxidative stability of jet fuels. The antioxidants include aromatic amines, mono- and bisalkylphenols, aminoalkylphenols, aminothiols and naphthols. Sterically hindered phenols show promise as antioxidant additives to hydrogenated jet fuels. The technology of producing derivatives of 2,6-di-tert-butylphenol with various types of substitutes in the n-position to the hydroxyl group is being developed for stabilization of hydrogenated jet fuels. These antioxidants are being investigated in a mixture with other antioxidants to produce composites having a synergetic effect. References: 45 Russian.
[52-6521]

UDC 547.2:542.91

SYNTHESIS OF ALIPHATIC HYDROCARBONS FROM CARBON MONOXIDE AND HYDROGEN ON COBALT-CALCIUM ALUMINATE CATALYSTS

Moscow NEFTEKHIMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 823-826
manuscript received 1 Apr 80

LAPIDUS, A. L., BRUK, I. A., YAKERSON, V. I., MAMAYEVA, I. A. and GOLOSMAN, Ye. 2., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, and Novomoskovsk Branch of State Scientific Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis

[Abstract] Systems based on high-strength calcium aluminates containing cobalt as the active component and various promoter additives were used as catalysts for synthesis of aliphatic hydrocarbons from carbon monoxide and hydrogen. The catalytic activity of cobalt catalysts produced by mixing basic cobalt carbonate and magnesium oxide with calcium aluminate or with a mixture of 50 percent calcium aluminate and 50 percent calcium dialuminate was investigated. Most of the paraffin hydrocarbons formed on cobalt-calcium aluminate catalysts are made up of normal hydrocarbons. The isostructure of hydrocarbons increases from 12.5 to 24.5 percent as the magnesium oxide content increases. Liquid catalysts produced on cobalt and calcium aluminate contacts are similar to those produced on cobalt, magnesium oxide

and diatomaceous earth catalyst, but are different from those produced on a zeolite-containing contact. A catalyst containing 2.5 parts of mass of magnesium oxide displays the greatest activity. The yield of liquid hydrocarbons when using magnesium oxide catalyst reaches 102.4 g/nm³ at 220°. References: 6 Russian. [52-6521]

STRUCTURE AND PROPERTIES OF IRON CATALYSTS IN CARBON MONOXIDE HYDRATION PROCESSES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 8-17

KRAVTSOV, A. V., SUDOBIN, N. G., SMOL'YANINOV, S. I., DNEPROVSKIY, S. N., LEVASHOVA, A. I. and MAKSIMOV, Yu. V.

[Abstract] Since carbon monoxide hydration processes remain important in the production of synthetic fuels and synthetic raw materials for the petrochemical industry, the structure, phase composition and possible structures of iron-base catalysts are examined in the interest of finding inexpensive, abundant, active and stable catalysts. The typical grade CA-1 fused catalyst is a spinel oxide, which is harder to obtain than stoichiometric magnetite. The starting spinel should be modified by processing with reducing, nitriding and carbiding agents to produce a catalyst that is more active and stable over a long period of time. Studies conducted for the purpose of discovering the optimum conditions for preparing catalysts for synthesis, and determination of a catalyst structure that is active and stable during synthesis at moderate pressure indicate that reduction of the starting catalyst at 25°C steps from 400-525° for 9 hours significantly increases its activity. The Mossbauer and x-ray diffraction parameters of various spinels are given. Careful analysis of reduced specimens after processing with NH₃ did not disclose any indications of nitride phases. The role of nitriding and carbiding agents quite probably consists in the reaction activation of the metal, related to the embedding of atomic nitrogen and carbon in the α -Fe structure. An analysis of synthesis from CO and H₂ on CA-1 catalyst shows that the Fe₃O₄ and α -Fe phase combination is the active contact. The applied phase of the starting catalyst is finely dispersed iron oxide, localized in pores of kaolin and distonite carriers. Carbon monoxide and hydrogen molecules are activated on the catalyst surface and can be adsorbed as dipoles or dissociated atoms with an effective positive or negative charge. Gas chemisorption centers where negatively charged forms occur are assumed to be atoms of metals with uncompensated free valence. The surface mechanism of the formation of the primary HCOH radical is assumed to be identical for the investigated CO hydration processes on iron catalysts. When hydrogen in the initial mixture is replaced with water vapor conversion of carbon monoxide on nonstoichiometric magnetite, which supplies hydrogen for the second and main CO hydration stage, begins to emerge as the first stage of the process. The

final composition of the synthesis products depends on external conditions. Aging of the catalysts has a strong effect on the spectrum of the products. Of particular importance are the feasibility of modifying the activation of the components and the surface mechanism of synthesis with stoichiometric components. The group and fractional composition of products can be controlled by changing the degree of activation of hydrogen and the ratio of the reaction rates of hydration, polymerization and condensation of the surface synthesis mechanism. The selectivity and productivity of carbon monoxide hydration reactions can also be changed by using stoichiometric components. Tables 5; references 49: 33 Russian, 16 Western.
[64-7872]

Co-MgO-ALUMOSILICATE AND ZEOLITE CATALYSTS FOR SYNTHESIZING ALIPHATIC HYDROCARBONS FROM CO AND H₂

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 18-22

LAPIDUS, A. L., MINACHEV, Kh. M., ISAKOV, Ya. I., MASHINSKIY, V. I., PIROZHKOV, D., MATSOTA, S. V., KANDYBA, L. B., SELITSKIY, A. P., MEZHOV, V. D. and VAKULENKO, I. I.

[Abstract] Because of the importance of perfecting known catalysts and developing new ones for various processes for synthesizing synthetic liquid fuel and important chemical products from CO and H₂, the properties of Co-MgO-alumosilicate and zeolite catalysts are analyzed during the synthesis of aliphatic hydrocarbons from CO and H₂. Very efficient Co catalysts for synthesizing aliphatic hydrocarbons from CO and H₂, exhibiting reproducible characteristics, can be produced from synthetic alumosilicate and zeolite cracking contacts. These catalysts have high activity and selectivity in the formation of high-molecular products. Test results of Co catalysts containing 100 parts by weight cobalt and 200 parts by weight synthetic amorphous alumosilicate are tabulated. The data show that amorphous alumosilicate without cobalt is inactive in synthesis. Data on the effect of the alumosilicate concentration on the activity and selectivity of Co-MgO-alumosilicate catalysts are presented. Magnesium oxide not only increases the activity of Co catalysts, but also changes the composition of the synthetic products. Cobalt catalysts containing zeolite-filled alumosilicate beads exhibit high activity in the synthesis of hydrocarbons from CO and H₂. The activity, selectivity and stability of catalysts during synthesis can be controlled in a wide range of varying their chemical composition. The products synthesized on the investigated catalysts contain a considerable amount of isoparaffin hydrocarbons. Catalysts that include amorphous alumosilicate and zeolite-filled alumosilicate beads produce higher hydrocarbon yields at lower temperature than Co-MgO-ZrO₂-diatomite and the ceresin content is almost twice as high. The investigated

catalysts yield high-melting ceresina, which are very important in the national economy. Tables 5; references 6: 4 Russian, 2 Western.
[64-7872]

SYNTHESIS OF ALIPHATIC HYDROCARBONS FROM OXIDES OF CARBON AND HYDROGEN ON COMPLEX CATALYST

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 23-27

LAPIDUS, A. L., SAVEL'YEV, M. M. and KONDRAT'YEV, L. T.

[Abstract] Because of the urgency of producing synthetic automotive fuels from carbon, and in view of the relatively low productivity of heterogeneous cobalt or iron catalysts, the synthesis of C_1-C_4 alkanes from the oxides of carbon and hydrogen in the presence of the $Rh_{nLm}-AlBr_3-Al$ system is investigated. The application of Fisher-Tropsch complex catalysts may be very important. They have high productivity and high activity, even at low temperatures and pressures. The introduction of metallic aluminum leads to a sharp increase of the yields of hydrocarbons. The $CO:H_2$ ratio in the starting gas mixture exerts a strong effect on the process of the synthesis of hydrocarbons. The interaction of Lewis acid and coordinated CO promotes the breaking of the oxygen-carbon bond in CO molecule and facilitates the nucleophilic attack of the hydride ion on the coordinated CO molecule, thereby facilitating the reduction of CO to alkanes under easy conditions. Figures 2; tables 3; references 19: 5 Russian, 14 Western.
[64-7872]

DEVELOPMENT OF PRODUCTION TECHNOLOGY OF METHANOL AND HIGHER ALCOHOLS FOR FUEL AND ENERGY PURPOSES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 28-33

LEONOV, V. Ye. and KALINICHENKO, L. M.

[Abstract] A catalyst is developed for synthesizing methanol and higher alcohols, which makes it possible to reduce the process temperature and increase the yield of methanol and higher alcohols. The technology for the joint synthesis of a mixture of methanol and higher alcohols is investigated in a model through-flow reactor with 20-40 ml catalyst using industrial gas flows at 200-300 atm, 300-400°C and at a rate of $(10-40) \cdot 10^3 \text{ hr}^{-1}$. Formulas are found that describe the joint

synthesis of methanol and higher alcohols on modified catalyst. The reaction is accompanied by the formation of byproducts. The yield and composition of the reaction products are plotted as functions of temperature. Data are given on the composition of the gaseous phase and of condensed reaction products as functions of process temperature. When the catalyst is overheated the selectivity of the process in terms of isobutanol decreases. A kinetic equation is given for the rate of formation of methane in methanol synthesis on zinc-chromium catalyst, and the reaction is of zero order in terms of carbon monoxide, hydrogen and methane. Methane forms at the same rates during the joint synthesis of methanol and higher alcohols and during synthesis of methanol on industrial zinc-chromium catalysts. The activation energies of the processes are also about the same. The combined synthesis of methanol and higher alcohols offers advantages over the separate production. Figures 3; tables 1; references 7: 6 Russian, 1 Western.
[64-7872]

SYNTHETIC SOLID FUEL PRODUCTION FROM KANSKO-ACHINSKIY COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 39-43

ZVEREV, D. P., KRUCHKO, A. A., SMIRNOVA, T. S. and MARKINA, T. I.

[Abstract] The technology is developed for the heat treatment of lignite with gas heating agent in eddy chambers for the purpose of converting the coal to various kinds of desired synthetic solid fuels. The use of an eddy flow takes fullest advantages of the specific properties of lignite for the synthesis of products with the desired properties, from dried peat to coke. High-caloric thermocoal fuel is produced by heating coal to a relatively low temperature. The moisture is removed, basically oxygen compounds are destroyed and ballast oxygen is eliminated. After the heated coal is aged under nearly isothermal conditions, cooled and passivated, the thermocoal has a combustion heat of 6,200-6,400 kcal/kg and is a high-caloric fuel for power plants equipped with steam generators with pulverized coal combustion systems. Economic calculations show that it will cost 0.64 rubles/ton to produce thermocoal, and capital investments in the construction of a plant will be 4.6 rubles/ton conventional coal for a plant with an annual capacity of 50 million tons. The results of three-stage heating of Irsha-Borodinskiy coal with gaseous heat transfer agent to different final temperatures are presented. The products of high-rate heat treatment of coal in eddy chambers were tested as raw material for hydrogenation, combustion, gasification and pelletizing. A 100-ton per hour high-rate coal processing plant will be built for Irsha-Borodinskiy cross section No. 2. Figures 1; tables 2; references: 10 Russian.
[64-7872]

SOME PRINCIPLES OF THERMAL DECOMPOSITION OF SHALE IN SOLID HEAT TRANSFER REACTORS
AND POSSIBILITIES OF TECHNOLOGICAL FORECASTING

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 44-50

ROKHETLA, I. I., IORUDAS, K. A., ELENURM, A. A., TYAGUNOV, B. I. and
GUBERGRITS, M. Ya.

[Abstract] The use of small pilot test stand reactors for thermal conversion of fuel shale with solid heat transfer agent is examined for the purpose of developing a technological forecast, characterizing possible target product yield indices, total process efficiency and trends in the change of the distribution and quality of basic products and choice of optimum technological variations. The experiment is conducted by way of example of Baltic kuckersite as a standard. It is shown that the reproducibility of the most important principles that control the integral process, and trends in the change of the composition of the product when process conditions are varied are the main criteria for the reliable technological forecasting of the indices of the thermal conversion of fuel shale using solid heat transfer agent. The distribution functions of fuel particles during their residence time in the reactor are established, and the Pekle diffusion criterion, which determines how the conditions of motion of the material are maintained and the degree of homogenization in a given system, is estimated. The feasibility of satisfactory process reproducibility is demonstrated on the basis of the established approximate degree of conversion of kerogen. Regular changes in product yield, distribution and quality, determined by the temperature potential in the reaction zone, are related basically to the soft thermal pyrolysis, inherent to the process, of volatile compounds with organic coking. Cracking reactions and the breaking of carbon bonds dominate in the formation of light fractions. Figures 5; tables 1; references 7: 6 Russian, 1 Western.

[64-7872]

ECOLOGICAL ENGINEERING PROBLEMS OF SYNTHETIC FUEL PRODUCTION FROM COAL AND
TRAINING OF SPECIALISTS FOR THIS FIELD

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 72-77

KHARLAMPOVICH, G. D.

[Abstract] Ecological aspects of synthetic fuel production from coal are discussed in connection with the future construction of enormous central coal processing plants and transportation of synthetic fuels to the European section of the USSR for consumption. Environmental protection will determine the requirements on the

equipment of the new plants. The ecological engineering criteria are the feasibility of producing synthetic fuels in large-unit capacity reactors, the feasibility of utilizing the heat of exothermic processes, the suitability of the technological process for automated control and its high reliability, and the relative simplicity of technology. The ecological criteria are the preparation of fuel for processing that precludes the formation of large quantities of water pollutants, the use of technology that does not necessitate the formation of complex multicomponent mixtures, and the complete and efficient utilization of all coal conversion products, including ash, nitrogen and sulfur compounds. The economic criteria are the production of fuels at low reduced cost, high consumer value and consumer versatility and transportability. Ammonia should be scrubbed in a cyclic process to produce anhydrous ammonia. Hydrogen sulfide should be trapped in a cyclic process to produce elemental sulfur. Various processes for producing synthetic liquid and gas fuels are examined from the standpoint of these criteria. There is a need to undertake scientific research and experimental design work on this problem on a vastly broader front than currently. To do this and to operate pilot and demonstration plants it will be necessary to train specialists. The specialties will be "chemical solid fuel technology", "petroleum technology", "basic organic synthesis technology" and "chemical industry machinery and reactors." Unfortunately, the existing programs do not meet the specifications of the new complex field of synthetic fuel technology. Capable and ambitious students must be selected to build a corps of well trained experts. Training plans for new specialties must be approved and students enrolled. Training time should be 5.5-6 years. Specialists of the new field should be trained at universities with the best qualified personnel, near experimental design and industrial bases of the corresponding profile, primarily in Moscow, Leningrad, Khar'kov, Sverdlovsk and Tomsk. The Methods Council of the Ural'sk Polytechnical Institute drafted the main and transition training plans and logical structure plan of the specialties. [64-7872]

COMPREHENSIVE UTILIZATION OF PEAT--NATIONAL WEALTH OF THE LAND

Moscow KHIMIYA TVERDOGO TOPLIVA in Russia: No 1, Jan-Feb 81 pp 78-85

RAKOVSKIY, V. Ye. and GUSEVA, M. V.

[Abstract] Because of the depletion of natural resources and the energy crisis, growth of the national population and demand for fuel it is important to develop the production of peat and sapropel as fuel minerals that occupy an intermediate position between live plants and coals, and which combine the advantages of living vegetation and fossil fuel. They are the only fuel resources that are restored to any extent by nature through the rotation of organic matter. Photosynthesis for

the production of fuel cannot be viewed as a limitless source for chemistry and power engineering. Food substitutes can be prepared today from peat carbohydrates. Photosynthesis will permit the large-scale production of organic semifinished raw materials, and microbiological synthesis will permit the final conversion of photosynthesis products to the corresponding chemical raw materials or fuel. The USSR possesses 65% of the world peat reserves, which provide industry, life and agriculture with products and raw material. Ways to make comprehensive utilization of fuel deposits and of the fuel itself should be the main trend of forthcoming studies. The products of photosynthesis as sources of food and feed are an important source of indispensable consumer products. Peat represents both a fuel and a chemical raw material, containing a high percentage of polysaccharides. Peat has been tested as feed for livestock, poultry and fish. After carbohydrates are removed the peat residue has high caloric content, contains twice as much waxes and may be used as fuel, bituminous raw material or can be converted by oxidation with oxygen to oxycarbonic acids. Peat is a source of plant and animal growth stimulators, organomineral fertilizers, activated charcoal and fuel. [64-7872]

SUITABILITY ASSESSMENT OF COAL FOR SYNTHETIC FUEL PRODUCTION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 86-91

YEREMIN, I. V., ZHAROVA, M. N. and SKRIPCHENKO, G. B.

[Abstract] Scientifically sound methods are needed for evaluating coals as raw material for the production of various synthetic fuels to assure the efficient utilization of coal in the future. A unified scientific raw material selection principle, based on general concepts of the composition of coal, its genesis, structural and chemical properties, and on data about the conversions to which coal is subjected in thermal, thermochemical and catalytic reactions, characteristic of individual processes. Economic considerations must also be taken into account. Special scientific research, embracing these questions, is needed for the solution of this problem. The principles of the petrologic-genetic classification of coal are used as the unified principle for the selection of raw material for the production of synthetic fuels. The properties of ash residues are the sole limiting index of the feasibility of using coals for gasification. The temperature characteristics not only determine the slag removal system, but also are related to the temperature range of the basic process. IGI [Institute of Mineral Fuels] is conducting a complex of petrographic, chemical and physicochemical analyses for the purpose of finding scientifically sound parameters for estimating the suitability of coals for hydrogenation liquifaction. The specific requirements of technology, which must be drafted in the form of technological requirements on raw material,

must be taken into account for every process, and special scientific research must be continued in order to answer these questions for different processes.

Figures 1; tables 1; references 10: 7 Russian, 3 Western.

[64-7872]

GROUP STRUCTURE CHARACTERISTICS OF HIGH-BOILING FRACTIONS OF LIQUID PYROLYSIS PRODUCTS OF SHALE GASOLINE

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 81 pp 129-133

manuscript received 24 Oct 79

KOSHEVNIK, A. Yu., KURASHEV, M. V., MASHIN, V. N. and SHISHKIN, M. V.

[Abstract] The group structure composition of high-boiling fractions of the liquid pyrolysis products of shale gasoline is analyzed by paramagnetic resonance and IR-spectroscopy techniques. The group structure analysis procedure based on spectral data, used earlier by the authors for analyzing high-boiling fractions of liquid pyrolysis products of crude was used for this purpose. There is an urgent need for development of a comprehensive method of analyzing these fractions, including the utilization of spectral methods, chemical functional analysis and chromatography. An industrial product, representing the distillation residue of pyrolysis resin of phenol hydroxyl protons is calculated on the basis of the elemental composition and paramagnetic resonance spectra of solutions in hexametaphol. Hydrogen atoms of phenol hydroxyls and hydrogen atoms in double bonds were taken into account during calculation of the characteristics of aromaticity. An analysis of the FMR spectra of solvents and of data on the elemental composition show that most of the oxygen in the fractions exists in the phenol hydroxyl groups. Figures 1; tables 4; references 7: 3 Russian, 4 Western.

[64-7872]

UDC 535.217;541.128;541.141;620.91;620.92

POSSIBLE METHODS AND PERSPECTIVES OF GENERATING PHOTOCATALYTIC CONVERSIONS OF SOLAR ENERGY

Moscow USPEKHI KHIMII in Russian Vol 49, No 8, Aug 80 pp 1457-1497

ZAMARAYEV, K. I. and PARMON, V. N., Institute of Catalysis, Siberian Department of the USSR Academy of Sciences, Novosibirsk

[Abstract] Existing methods of transforming solar energy may be divided into four types: thermomechanical, photo-physical, photochemical (including photoelectrolysis)

and photobiological (natural photosynthesis). Advantages, disadvantages, and efficiencies of the four types are considered. At the present time, the most attractive method for large amounts of energy is the direct conversion to electrical or chemical energy. The direct photo-physical conversion of photons using the n-p transition in semiconductors is the most practicable. The energy losses seem to be a limiting factor for this approach. The latter two-thirds of the article considers the dissociation of water into hydrogen and oxygen. Topics include the thermodynamics, the mechanisms, and the constraints of using visible light. Four possible operational systems are considered to carry out the photocatalytic dissociation of water: 1. The product of the initial oxidation (or reduction) remains in solution where it participates in further reactions which generate reducing (or oxidizing) species capable of dissociating the water molecule 'n the dark. 2. Same as # 1, except that the product of the oxidation (reduction) remains coordinated with either the photocatalyst or other acceptor compound in solution. 3. The oxidation (reduction) is not the initial but a subsequent reaction. 4. The water is dissociated on the surface of a heterogeneous catalyst. Light is used for photodesorption. References 408: 116 Russian, 292 Western; figures 5; tables 5.

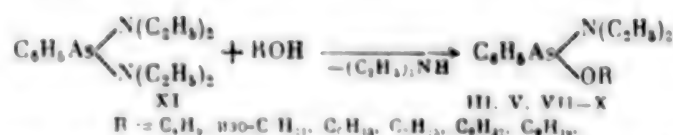
[55-12027]

METHODS OF PREPARATION AND PROPERTIES OF PHENYLARSONOUS ACID AMINOETHERS

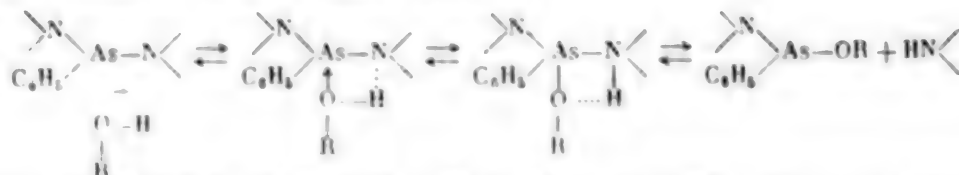
Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1. Jan 81, pp 87-92
manuscript received 7 Apr 80

IONOV, L. B., KOROVYAKOV, A. P., ZOBININ, S. I. and SHCHUKLIN, V. A.,
Udmurtskiy State University imeni 50th Year of the USSR

[Abstract] Diethylamidophenylarsonous acid is prepared by the alcoholysis of tetraalkyldiamides, particularly when the amine which is also formed is removed from the reaction:



Aminoethers with primary alkyl radicals may also be prepared by the reaction of compound (XI) with $\text{C}_6\text{H}_5\text{AsCl}_2$, yielding a compound similar to the product of the above reaction except that the OR group has been replaced with Cl. The chloride form can be converted into the ester by reaction with an alcohol ROH for $\text{R} = \text{C}_3\text{H}_5, \text{C}_3\text{H}_7$, tert- C_4H_9 , iso- C_5H_{11} , tert- C_5H_{11} and C_9H_{19} . The reaction apparently occurs via the nucleophilic attack of the unshared electron pair of the hydroxyl-oxygen on the As atom and the hydrogen bonding of the hydroxyl-hydrogen to the N atom with the formation of a four-centered transitional complex:



The structures were confirmed by infrared and nuclear magnetic resonance spectroscopy. Figures 1; tables 1; references 16: 9 Russian, 7 Western.

[62-12027]

PHOSPHONIUM AND ARSONIUM DERIVATIVES OF THE IODOPENTACARBONYLS OF THE VI GROUP METALS

Leningrad Zhurnal Obshchey Khimii in Russian Vol 50 No 11, Nov 80 pp 2623-2624
manuscript received 22 May 80

MAGOMEDOV, G. K-I. and FRENKEL', A. S.

[Abstract] It was established that iodopentacarbonyl metal complexes $[\text{Ph}_3\text{E}^+\text{M}(\text{CO})_5\text{I}^-]$ can be formed by refluxing $(\text{Ph}_3\text{E})^+\text{I}^-$ with $\text{M}(\text{CO})_6$ (where $\text{E} = \text{P}$ or As , $\text{M} = \text{Cr, Mo, W}$) for 10 hrs in decane, or by irradiating the reagents in THF. The following complexes were obtained (E, M, m.p. being reported): $\text{P, Cr, } 79-80^\circ\text{C}$; $\text{P, Mo, } 94-96^\circ\text{C}$; $\text{P, W, } 101-104^\circ\text{C}$; $\text{As, Cr, } 88-90^\circ\text{C}$; $\text{As, Mo, } 89-92^\circ\text{C}$; and $\text{As, W, } 106-107^\circ\text{C}$. The yield of phosphonium complexes was in the range of 70-80%, that of the arsonium--30-50%. References 3: 2 Russian, 1 Western.
[82-7813]

UDC 547.242

SYNTHESIS OF (p-TOLYL)ALKYLARSINE DICHLORIDES AND THEIR REACTIONS

Leningrad Zhurnal Obshchey Khimii in Russian Vol 50, No 11, Nov 80 pp 2517-2520
manuscript received 25 Oct 79

GIGAURI, R. D., GODERDZISHVILI, L. I., SHATAKISHVILI, T. N., CHERNOKAL'SKIY, B. D. (Deceased) and BURDULI, K. Ya., Tbilisi State University

[Abstract] Di(p-tolyl)alkylarsines (I) can be easily chlorinated with Cl_2 in CCl_4 to yield respective dichlorides. Aqueous hydrolysis of di(p-tolyl)alkylarsine dichlorides (II) leads to a mixture of starting material and hydroxyarsonium salts from which no individual compounds could be isolated. When the hydrolysis was carried out in the presence of NaOH , an almost quantitative product was formed--the oxide of I. This reaction could be used for the titration of II. Thermal decomposition of II yields $(\text{p-CH}_3\text{C}_6\text{H}_5)_2\text{AsCl}$ and alkyl chloride. References 8: 6 Russian, 2 Western.
[82-7813]

SYNTHESIS OF SOME METHYLDI(p-HALOPHENYL)ALKYL(ARYL) ARSONIUMS AND THEIR PROPERTIES

Leningrad ZHURNAL ORGANICHEKHOY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2514-2516
manuscript received 11 Oct 79

GIGAURI, R. D., TIGISHVILI, Z. L., INDZHIYA, M. A., GURGENIDZE, N. I. and
CHERNOKAL'SKIY, B. D. (Deceased), Tbilisi State University, Kazan' Chemical-
Technological Institute imeni S. M. Kirov

[Abstract] Di[p-chloro(bromo)phenyl]alkyl(aryl)arsines (I) do not react with alkyl chloride or bromide. It was possible to add CH_3I to I at room temperature to yield methyldi[p-chloro(bromo)phenyl]alkyl(aryl)arsonium (II) salts. The iodide ion in these compounds can be titrated using the mercurimetric method. Evidently this is due to the formation of nondissociated HgI_2 . When reacted with aqueous solution of cadmium iodide, II almost quantitatively converts to its tetraiodocadmium complex which is insoluble in water. This reaction could be used in quantitative analysis of many cations. References 8: 7 Russian, 1 Western.
[82-7813]

ORGANOPHOSPHORUS COMPOUNDS

UDC 542.91:547.1'118

ISOMERIZATION OF S-2-OXYALKYL ESTERS OF CYCLIC THIOACIDS OF PHOSPHORUS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11, Nov 80
pp 2594-2596 manuscript received 10 Dec 79

NURETDINOVA, O. N. and GUSEVA, F. P., Institute of Organic and Physical Chemistry
imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Isomerization of S-2-oxyalkyl esters of cyclic thioacids of phosphorus produced by interaction of these acids with α -oxides of alkylenes was studied to determine the possibility of regrouping in some cyclic derivatives of thioacids of phosphorus and the dependence of the process on the value of the cycle of the initial thioacid. All the S-2-oxyalkyl esters are transformed to 2-mercaptoalkyl esters regardless of the value of the cycle of the initial thioacid of phosphorus and its substitution.

[48-6521]

UDC 542.91:547.1'118

SYNTHESIS OF ω -SUBSTITUTED BUTENE ESTERS OF PHOSPHORUS THIOACIDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 11, Nov 80
pp 2503-2594 manuscript received 11 Jan 80

GODOVIKOV, N. N., VUKHREVA, L. A., PUDOVA, T. A. and KARACHNIK, M. I., Institute
of Element Organic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences,
Moscow

[Abstract] Synthesis of phosphoric acids containing the acetylene bond in the alkylthiol radical was investigated. The presence of the hard fragment in the thioester radical possibly contribute to the selectivity of the organophosphorus inhibitors with respect to choline esterases of different origin. The compounds were synthesized by interaction of sodium or potassium salts with the corresponding monothioacids of phosphorus having excess 1,4-dichlorobutene-2 to produce ω -chlorobutene esters of thioacids of phosphorus. The corresponding ω -substituted

butene esters of monothioacids of phosphorus were then produced by interaction with different nucleophilic reagents. The structure of the compounds was confirmed by infrared and red spectra and was proved by counter synthesis. References 4: 3 Russian, 1 Western.
[48-6521]

UDC 548.737

STRUCTURE OF THE PRODUCT OF THE REACTION OF HEXAETHYLTRIAMINOPHOSPHINE WITH CARBON BISULFIDE, ADDITIONAL COORDINATION OF THE PHOSPHORUS ATOM BY THREE SULFUR ATOMS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 255, No 5, 1980 pp 1190-1192
manuscript received 10 Jun 80

YOFIT, D. S., STRUCHKOV, Yu. T., FUDOVIK, M. A., KIMARDINA, L. K.,
ALEKSANDROVA, I. A., KHAYRULLIN, V. K. and FUDOVIK, A. N., USSR Academy of Sciences
corresponding member, USSR Academy of Sciences Kazan' Branch Institute of Organic
and Physical Chemistry imeni A. Ye. Arbuzov and Institute of Hetero-Organic
Compounds imeni A. N. Nesmeyanov, Moscow

[Abstract] In studying the structure of phosphorus derivatives produced as the result of adding molecules of carbon bisulfide at one, two or three P-N bonds, ^{31}P NMR spectroscopic data have indicated anomalously high values of chemical shifts clearly associated with increased coordination of the phosphorus atom in these derivatives. This phenomenon has been observed for product I of the reaction of hexaethyltriaminophosphine with three molecules of carbon bisulfide, carried out in a study by Oertel, Mals and Holschmidt (1964). This product has a melting point of 137 to 140°C. The results are given here of an x-ray structural analysis of product I for the purpose of answering the question of whether additional coordination takes place in a molecule of this compound. Crystals of product I, with a formula of $\text{C}_{15}\text{H}_{30}\text{P}_6\text{N}_3$, are monoclinic. The coordinates and bond angles of non-hydrogen atoms are presented in tables. An illustration is given of the geometrical structure of the molecule, without H atoms, with an indication of bond lengths. In a molecule of product I the sulfur atoms of the three CS_2 molecules added at the P-N bonds form strong bonds with the central phosphorus atom, and the remaining three thione sulfur atoms lie at a distance from the central phosphorus atom which is considerably shorter than the sum of the Van der Waals radii of sulfur and phosphorus. This represents a confirmation of the fact that strong additional intramolecular coordination of the phosphorus atom by means of the three thione sulfur atoms takes place and this explains the anomalous value of the ^{31}P shift in NMR spectra. The phosphorus atom exhibits sevenfold coordination, taking into account the three additional coordinated sulfur atoms and the unshared electron pair. The six sulfur atoms form around the phosphorus atom a distorted octahedron with the

three covalent bound sulfur atoms forming one of its triangular faces, and the three added coordinated sulfur atoms another face antiparallel to the first. Figures 1; references 11; 3 Russian, 8 Western.
[41-8831]

UDC 541.124.7

INVESTIGATION OF THE INTERACTION OF CYCLIC AND ACYCLIC PHOSPHORUS AND CARBON DERIVATIVES WITH SOLVENTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 255, No 5, 1980 pp 1169-1172
manuscript received 19 Jun 80

OVCHINNIKOV, V. V., CHERKASOV, R. A. and FUDOVIK, A. N., USSR Academy of Sciences corresponding member, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] There has been little study of the problem of making a quantitative estimate of the influence of solvents on the physicochemical characteristics of phosphorus-containing molecules of the same type but differing in terms of structural organization. There have been data indicating certain differences in the nature of the interaction with solvents of cyclic and acyclic phosphorus-containing molecules. Here the results are given of a calorimetric study of the heats of solution and of a determination of ^1H and ^{31}P NMR spectral characteristics of neutral cyclic and acyclic phosphorus- and carbon-containing molecules of the same type in solvents differing in nature. The subjects of study were pinacone (I) and dipropyl (II) methyl phosphonate and pinacone (III) and dipropyl (IV) acetals of benzaldehyde. The phosphorus and carbon derivatives studied have approximately identical molecular volume in vapor form. As a result, the experimentally obtained difference in relative values of the transfer of the heat of solution was used as a measure of the difference in the interaction of a specific solvent with vapors of these compounds with reference to cyclohexane as a standard. An analysis of data on these values makes it possible to conclude that cyclic carbon and phosphorus derivatives interact with practically all the solvents studied better than do their acyclic analogues. In taking the space structure of the compounds studied into account, it can be seen that securely attached fragments of molecules of pinacone methyl phosphonate and of the pinacone acetal of benzaldehyde having an almost flat shape create fewer space obstacles for the approach of molecules of the solvent and for the formation of a solvate complex as compared with two propoxy radicals equal in terms of the number of carbon atoms and having the ability to spin. The better solvation characteristics of cyclic molecules are associated with this phenomenon and probably with the lesser steric effect of the dioxyalkylene substituent. Figures 1; references 10; 8 Russian, 2 Western.
[41-8831]

SYNTHESIS, STRUCTURE AND TRANSFORMATIONS OF ESTERS OF α -KETOPHOSPHONIC ACIDS

Moscow USPEKHI KHIMII in Russian No 9, Sep 80 pp 1730-1750

ZHDANOV, Yu. A., UZLOVA, L. A. and GLEBOVA, Z. I., Rostov State University and Scientific Research Institute of Physical and Organic Chemistry attached to Rostov State University

[Abstract] Investigations on the synthesis and properties of esters of α -ketophosphonic acids, a class of highly reactive organophosphorus compounds, are generalized. Acylation of esters of phosphorus acid, variants of the reaction of which are distinguished from each other by the nature of the acylating substance and by the structure of the derivative of the trivalent phosphorus acid, is the basis for synthesis of esters of α -ketophosphonic acids. Cases of abnormal course of the process during synthesis of esters of α -ketophosphonic acids by Arbuzov's reaction are presented. Interactions of esters of α -ketophosphonic acids with proton-containing compounds, with aprotic nucleophilic reagents and substitution reactions with carbonyl oxygen are discussed. The hydrocarbon content of esters of α -ketophosphonic acids is given. References 162: 97 Russian, 65 Western. [47-6521]

UDC 547.261'118

PHOSPHORYLATION OF 1-SUBSTITUTED AZIRIDINES BY ACID CHLORIDES OF ACIDS OF PHOSPHORUS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2171-2184
manuscript received 22 Feb 80

GUBNITSKAYA, Ye. S., SEMASHKO, Z. T., PARKHOMENKO, V. S. and KIRSANOV, A. V., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] As a continuation of research on the reactivity of 1-substituted aziridines, a detailed study is made of the phosphorylation of 1-substituted aziridines by acid chlorides of acids of pentavalent phosphorus and a study is made of reactions of 1-substituted aziridines with acid chlorides of acids of trivalent phosphorus. All reactions were carried out in nonaqueous solvents. The reaction of 1-alkyl aziridines with phosphorus trichloride and diethyl chlorophosphite takes place easily with the formation of N-substituted amidophosphites. For example, N-(2-cyanoethyl)-N-(2-chloroethyl)amidodichlorophosphite is produced as follows: To a solution of 0.05 mole of phosphorus trichloride in 50 ml of benzene or CCl_4 is gradually added with energetic stirring at 2 to 4°C in an atmosphere of nitrogen a solution of 0.05 mole N-(2-cyanoethyl)aziridine in 50 ml of benzene or CCl_4 . The

mixture is stirred at 20°C and is allowed to stand at this temperature for 10 h. The solvent is then concentrated by evaporation and the residue and phosphite are sublimated separately in succession in an atmosphere of nitrogen. The reaction begins with the attack of the acid chloride on the nitrogen of the aziridine ring with the formation of aziridinium salts which are unstable and under the effect of a nucleophilic chlorine atom undergo opening of the aziridine ring. It was possible for the first time to separate chlorides of phosphorylated aziridinium. These chlorides are colorless finely crystalline low-melting substances which are easily hydrolyzed by the moisture of the air. They melt easily and are converted into amidophosphites. When 1-alkyl aziridines are acted upon by acid chlorides of phosphoric and phosphonic acid opening of the ring easily occurs and the corresponding 2-chloroethyl amides of acids of phosphorus are formed with high yields. The reaction of 1-alkyl aziridines with acid chlorides of acids of phosphorus can be used as a convenient preparative method of adding a 2-chloroethyl amide group to molecule of organophosphorus compounds. When 1-phosphorylated aziridines are reacted with phosphorus pentachloride an exothermic reaction takes place without difficulty and lasts several hours. In this reaction an intermediate product, probably a phosphorane, is formed, which under the effect of sulfur dioxide is converted into a phosphate. This method of producing compounds with a P-N-P bond system can serve as a preparative method of synthesizing these substances, so important from the practical viewpoint. When the N-substituted amidophosphites are distilled under vacuum Arbusov rearrangement takes place, the ethyl chloride is detached and a new type of 4-member heterocyclic compound is formed--1-alkyl-2-ethoxy-2-oxo-1,2-azaphosphoethidines. These compounds exhibit interesting chemical properties and can act as raw material for synthesizing unknown or nearly inaccessible 2-aminoethyl phosphonic acids and their derivatives. When acid dichlorides of N-alkyl-N-(2-chloroethyl)amidophosphoric acids react with amines, triamides of phosphoric acid are formed and when these are reacted with an alcoholate of sodium the corresponding diazaphospholidines are produced with high yields. References 17: 12 Russian, 5 Western.

[26-8831]

UDC 547.26'118

TRIS(2,2,2-TRICHLOROETHOXY)AMINOCHLOROPHOSPHORANES AND TETRA(2,2,2-TRICHLOROETHOXY)-AMINOPHOSPHORANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2184-2188
manuscript received 22 Jan 80

MARKOVSKIY, L. N., SOLOV'YEV, A. V. and SHERMOLOVICH, Yu. G., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] A study is made of the synthesis and properties of acyclic tris(2,2,2-trichloroethoxy)aminochlorophosphoranes and tetra(2,2,2-trichloroethoxy)amino-phosphoranes. Tris(2,2,2-trichloroethyl)phosphite reacts at 20°C in an Arbusov rearrangement reaction with N-chloropiperidine and N-chloromorpholine to form

crystalline tris(2,2,2-trichloroethoxy)aminochlorophosphoranes (I). Compounds (I) are colorless crystalline substances which are soluble in polar organic solvents and are stable with the absence of moisture in the air at 20°C for a prolonged period. When compounds (I) are heated for an hour at 180°C they undergo Arbusov rearrangement to form 1,2,2,2-tetrachloroethane and amides of bis(2,2,2-trichloroethyl)phosphoric acid (II). The hydrolysis of chlorophosphoranes (I) with an excess of water results in the formation of a mixture of an amide (II) and of tris(2,2,2-trichloroethyl)phosphate (III). Chlorophosphoranes (I) react easily with trichloroethanol in the presence of triethylamine to form tetraalkoxyamino phosphoranes (V). Compounds (V) are the first representatives of acyclic alkoxy-amino phosphoranes separated in the individual state. They are colorless crystalline substances which are soluble in the majority of organic solvents and are stable at 20°C. Tris(2,2,2-trichloroethoxy)aminochlorophosphoranes (I) are produced as follows: To a solution of 0.0063 mole of tris(2,2,2-trichloroethyl)phosphite in 20 ml of carbon tetrachloride stirred at 20°C is added an equivalent amount of N-chloropiperidine or N-chloromorpholine. After 5 h the chlorophosphorane residue (I) is filtered off, dried under vacuum and purified by means of crystallization. References 11: 8 Russian, 3 Western.
[26-8831]

UDC 547.491+547.241

PHOSPHORYLATION OF N-TRIMETHYLSILYL- AND N-CHLORO-1-CYANO-2,2,2-TRICHLOROETHANIMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2188-2194
manuscript received 31 Jan 80

LAZUKINA, L. A., KRISHTAL', V. S., SINITSYA, A. D. and KUKHAR', V. P., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] As a continuation of studies on the use of N-trimethylsilyl-1-cyano-2,2,2-trichloroethanimine in organic synthesis, the results are given of a study of the reaction of N-trimethylsilyl- (I) and N-chloro-1-cyano-2,2,2-trichloroethanimines (II) with compounds of trivalent and pentavalent phosphorus. N-trimethylsilylimine (I) reacts easily with phosphorus pentachloride and phenyltetrachlorophosphorane to form 1-trichlorophosphazo- and 1-phenyldichlorophosphazo-1,2,2,2-tetrachloro-1-cyanoethane (III) and (IV). Phosphazo compounds (III) and (IV) were also produced by the oxidative imination of phosphorus trichloride and phenyldichlorophosphine by means of N-chloroimine (II). When (I) reacts with triphenyldichlorophosphorane, triphenyl(1-cyano-2,2,2-trichloroethylimino)phosphonium chloride (V) forms, and not a triphenylphosphazo compound. The structure of phosphonium salt (V) agrees with IR spectroscopy data revealing absorption bands characteristic of vibrations of C=N and C=N groups. When compounds (III) react with triethylphosphite the α,β -elimination of chlorine atoms takes place to form

1-trichlorophosphazo-1-cyano-2,2-dichloroethylene (IX). These reactions take place with the participation of the nitrogen atom of the imino group of compounds (I) and (II). Compound (I) reacts easily with trialkyl phosphites to form 1-trialkoxo-phosphazo-1-cyano-2,2-dichloroethylenes (XIII). Reactions of N-trimethylsilyl- and N-chloro-1-cyano-2,2,2-trichloroethanimines with trialkyl phosphites and tri-phenylphosphine take place with the participation of the trichloromethyl group and N-phosphorylated derivatives of 1-cyano-2,2-dichlorovinylamines form.

References 11: 9 Russian, 2 Western.

[26-8831]

UDC 547.26'118+547.444.5+547.79

SYNTHESIS AND PROPERTIES OF Δ^4 -1,3,2-OXAZAPHOSPHOLINES. III

Leningrad ZHURNAL ORGANIC CHEMISTRY in Russian No 10, Oct 80 pp 2195-2203

manuscript received 18 Dec 79

BALITSKIY, Yu. V., NEGREBETSKIY, V. V. and GOLOBOV, Yu. G., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] As a continuation of studies on the phosphorylation of α -amino ketones by means of chlorides of phosphorus, the limits of the applicability of this reaction are established and the results are given of reacting acid chlorides of acids of pentavalent phosphorus with 1-(N-alkylamino)-3,3-dimethyl-2-butanones and 1-(N-alkylamino)-2-propanones and of producing new Δ^4 -1,3,2-oxazaphospholines. The reaction takes place in stages and the N-phosphorylated amino ketones produced at the first stage of the reaction because of the electron acceptor nature of the chlorophosphoryl group easily detach an α -proton under the influence of triethylamine and close into a ring to form Δ^4 -1,3,2-oxazaphospholines (II). Phospholines (II) are best produced by using this process from stable hydrochlorides of 1-(N-alkylamino)-3,3-dimethylbutanones-2, which as triethylamine is added segregate free bases having pK_a approximately 3.5 units lower than NEt_3 . The properties of compounds (II) are given, with the formulas $C_9H_{17}ClNO_2P$, $C_{10}H_{19}ClNO_2P$, $C_{11}H_{22}NO_2P$, $C_8H_{16}NO_2P$, $C_{10}H_{19}ClNOPS$, $C_7H_{13}ClNOPS$ and $C_{11}H_{22}NOPS$. Reactions of α -amino ketones with acid dichlorides of acids of phosphorus in the presence of triethylamine resulting in compounds (II) are of a rather general nature. When reaction according to the process described above is not possible, heterocyclic compounds (II) can be synthesized easily from available cyclic derivatives with trivalent phosphorus by means of oxidation, thionation, fluorination and imination or by other transformations which take into account the chemical stability of the oxazaphospholine ring. The reaction of 1-(N-tert-butylamino)-2-propanone, $MeP(S)Cl_2$ and triethylamine in chloroform results in a mixture of 2-thio-2,5-dimethyl-3-tert-butyl- Δ^4 -1,3,2-oxazaphospholine and 2-thio-2,5-dimethyl-3-tert-butyl- Δ^4 -1,3,2-thiazaphospholine.

Figures 1; references 17: 12 Russian, 5 Western.

[26-8831]

REACTIONS OF CHLORAL AND ISOTHIOCYANATES WITH α -AMINO PHOSPHONATES AND THE STRUCTURE OF PHOSPHONYLATED THIOUREA

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2203-2210
manuscript received 25 Feb 80

ZIMIN, M. G., BURILOV, A. R., ISLAMOV, R. G., POMINOV, I. S. and PUDOVNIK, A. N.,
Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] As a continuation of research on addition reactions of nucleophilic phosphorus-containing reagents, it has been found that ethers of α -aminoalkyl phosphonic acids can be added at C=O and C=N bonds. Dimethyl, dipropyl and diisopropyl ethers of N-methylaminobenzylphosphonic acid have been added to chloral. No catalyst is necessary for the reaction; the reaction is exothermic and is concluded in 5 to 6 h. Dialkyl ethers of N-methyl-N-(1-oxy-2,2,2-trichloroethyl)aminobenzylphosphonic acid (I) have been separated with a yield of 43 to 57 percent. It has been proven that the nucleophilicity of the nitrogen atom in α -amino phosphonates is sufficient for addition at the C=O group of chloral, in spite of the influence of the electron-acceptor phosphoryl group. The reactions studied here represent the first example of the use of α -amino phosphonates as nucleophilic agents. In order to react α -amino phosphonates with chloral, to 0.03 mole of chloral in 10 to 15 ml of anhydrous benzene were added in drops 0.03 mole of the dialkyl ether of N-methylaminobenzylphosphonic acid at a rate such that the temperature of the mixture would not exceed 50°C. On the next day the separated crystals were removed and reprecipitated from the ether by means of hexane and were dried under vacuum. Produced were the dimethyl ether of N-methyl-N-(1-oxy-2,2,2-trichloroethyl)aminobenzylphosphonic acid with a yield of 43 percent and a formula of $C_{12}H_{17}Cl_3NO_4P$, the diisopropyl ether of the same acid with a yield of 50 percent and a formula of $C_{16}H_{25}Cl_3NO_4P$, and a dipropyl ether of the same acid with a yield of 57 percent and a formula of $C_{16}H_{25}Cl_3NO_4P$. When dialkyl ethers of N-methylaminobenzylphosphonic acid and oxides of dibutyl-N-methylaminobenzylphosphine are reacted with isothiocyanates, N-methyl-N-(1-dialkylphosphonylbenzyl)-N'-substituted forms of thiourea are formed. These forms of thiourea are associated by means of intermolecular hydrogen bonds with the participation of NH and P=O groups in concentrated solutions and in the condensed phase. In dilute solutions an intermolecular H bond with the participation of NH and C=S groups is formed in addition. N-methyl-N-(dialkylphosphonylbenzyl)-N'-organylthioureas (II) are produced by mixing 0.04 mole of phenyl-, allyl-, benzoyl- and diisopropylthiophosphorylisothiocyanate with 0.04 mole of the dialkyl ether of N-methylaminobenzylphosphonic acid or the oxide of dibutyl-N-methylaminobenzylphosphine. Self-heating of the reaction mass is observed. The mixture is held at room temperature to the completion of crystallization. The addition products are recrystallized, washed with hexane and dried under vacuum. Figures 2; references 9: 8 Russian, 1 Western.
[26-8831]

TRIARYL(ISOCYANATOMETHYL)PHOSPHONIUM IODIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2210-2215

manuscript received 11 Feb 80

KOZHUSHKO, B. N., SILINA, Ye. B., GUMENYUK, A. V., TUROV, A. V. and SHOKOL, V. A.,
Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] Although attempts to separate iodomethylisocyanate in pure form by various methods failed, it was possible to produce relatively stable phosphorylated derivatives of this highly unstable compound. It was found that triaryl(isocyanatomethyl)phosphonium chlorides very easily replace the chlorine with iodine when they react with methyl iodide to form triaryl(isocyanatomethyl)phosphonium iodides. The reaction takes place when the substances are heated in methylene chloride for 1 to 2 h at 45 to 60°C. There is no need to produce in pure form triaryl(isocyanatomethyl)phosphonium chloride in advance, for it is sufficient to add triarylphosphine to the mixture of chloromethylisocyanate and methyl iodide and to heat the reaction mixture. Triphenyl(isocyanatomethyl)phosphonium iodide, tri-n-tolyl(isocyanatomethyl)phosphonium iodide and triaryl(alkoxycarbonylaminoethyl)phosphonium iodide have been produced. Triaryl(isocyanatomethyl)phosphonium iodides are slightly yellowish hygroscopic solid substances which break down when heated. They are soluble in methylene chloride and chloroform, but not in ether, petroleum ether, benzene and carbon tetrachloride. When reacted with alcohols they are converted into triaryl(alkoxycarbonylaminoethyl)phosphonium iodides, which are yellowish solid substances which are easily soluble in water, alcohol, chloroform and acetonitrile, but insoluble in ether and petroleum ether. When triaryl(isocyanatomethyl)phosphonium chlorides and iodides react with alcohols and amines, triaryl(alkoxycarbonylaminoethyl)- or triaryl(arylaminoethyl)phosphonium halides are formed. Amines react best with solutions of triaryl(isocyanatomethyl)phosphonium halides in methylene chloride or with a suspension of freshly prepared triaryl(isocyanatomethyl)phosphonium chloride in benzene without its separation from the reaction medium. Triaryl(arylaminoethyl)phosphonium halides are solid colorless substances soluble in alcohol, acetonitrile, and methylene chloride, but insoluble in water, acetone, dioxane, benzene, ether, petroleum ether and carbon tetrachloride. References 7: 3 Russian, 4 Western.

[26-8831]

REACTIONS OF COMPLETE ESTERS OF ACIDS OF TRIVALENT PHOSPHORUS WITH 1-NITRO-3,3,3-TRICHLORO-1-PROPENE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2215-2222
manuscript received 10 Jan 80

BORISOVA, Ye. Ye., GAREYEV, R. D. and SHERMERGORN, I. M., Kazan' Veterinary
Institute imeni N. E. Bauman

[Abstract] A detailed discussion is presented of data on reactions of complete esters of acids of trivalent phosphorus with 1-nitro-3,3,3-trichloro-1-propene. The reaction of trimethylphosphite with 1-nitro-3,3,3-trichloro-1-propene takes place very easily and gentle conditions are required to carry it out successfully. When this reaction is carried out in ether and at a temperature not greater than 25°C, O,O-dimethyl- α -nitromethyl- β , β -dichlorovinylphosphonate (I) is separated with a good yield. A detailed study of the reaction mixture by the nuclear magnetic resonance method showed that along with the formation of compound (I) small quantities of two other substances are present. One of these has been identified as trimethylphosphate and the other, according to IR spectroscopy data, as O,O-dimethyl- α -trichloromethyl- β -nitroethylphosphonate (V). The latter product is not formed when all the moisture has been carefully removed from the solvent and the initial nitroalkene. Compound (V) has been produced by reacting O,O-dimethyl- β -trimethylsilylphosphite with 1-nitro-3,3,3-trichloro-1-propene. In this reaction a sirupy liquid forms which gradually crysallizes upon exposure to the moisture of the air and is converted into compound (V). It has been demonstrated that when complete phosphites and phosphonites react with 1-nitro-3,3,3-trichloro-1-propene α -nitromethyl- β , β -dichlorovinyl derivatives of phosphorus form. When silylated phosphites and phosphonites are reacted with 1-nitro-3,3,3-trichloro-1-propene, trimethylsilyl esters of the corresponding phosphorylated nitronic acids form. When these esters are subjected to proton-donor reagents they are desilylated to form a mixture of α -nitro- β , β -dichlorovinyl and α -trichloromethyl- β -nitroethyl derivatives of phosphorus. Figures 2; references 10: 8 Russian, 2 Western.
[26-8831]

REACTION OF β -KETO ALCOHOLS WITH ACID CHLORIDES OF THIOPHOSPHONOUS ACIDS IN THE ABSENCE OF ORGANIC BASES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2222-2226
manuscript received 10 Apr 80

MUKHAMETOV, F. S., YELISEYENKOVA, R. M. and RIZPOLOZHENSKIY, N. I.

[Abstract] The results are given of a study of the reaction of β -keto alcohols and acid chlorides of thio acids of trivalent phosphorus in the absence of bases. It had been demonstrated earlier that this reaction in the presence of bases produces both ethers of acids of trivalent phosphorus and derivatives of γ -ketoalkyl phosphinic acids. No study had been made of this reaction in the absence of bases. Earlier studies (1972 and 1974) had shown that when acid chlorides of acids of trivalent phosphorus react with β -keto alcohols a drastic difference in the direction of the reactions and the structure of the final products takes place depending on whether or not an organic base is present. Data are presented on reactions of β -acetoethyl, β -acetopropyl, β -acetoisopropyl and diacetone alcohol with acid monochlorides of alkyl(aryl)thiophosphonous acids. All experiments were conducted under identical conditions, i.e., the acid chloride was added in drops at room temperature to the keto alcohol while stirring in a flow of inert gas. Stretching vibrations of the carbonyl and hydroxyl groups of the initial keto alcohol were monitored by means of IR spectroscopy while the reactions took place. In this way it was possible to judge whether these functional groupings take place in the reaction. The most pronounced changes in IR spectra were observed when using diacetone alcohol. It was demonstrated that when β -keto alcohols react with acid chlorides of thiophosphonous acids in the absence of organic bases, unlike in the presence of bases, products with a phosphorus atom with a coordination number of four form. These products are open-chain S-alkylalkyl(aryl)- γ -ketoalkylthiophosphinates and cyclic 2-alkyl(aryl)-2-oxo-3,3,5-trimethyl-1,2-oxaphosphol-4-enes. Higher yields of the γ -ketophosphinate are produced when using an acid chloride with electron donor radicals and of the oxaphospholene, with electron acceptor radicals. References 15: 12 Russian, 3 Western.

[26-8831]

REACTION OF CARBON TETRACHLORIDE WITH ESTERS OF ETHYLPHOSPHONOUS ACID

Leningrad ZHURNAL OBRSHCHEY KHIMII in Russian No 10, Oct 80 pp 2226-2229
manuscript received 31 Jan 80

KRUTIKOV, V. I., LAVRENT'YEV, A. N., MASLENNIKOV, I. G., BLINOVA, G. G. and SOCHILIN, Ye. G., Leningrad Technological Institute imeni Lensovet [Leningrad Soviet of Workers' Deputies]

[Abstract] Hitherto the reaction of CCl_4 with esters of phosphonous acids has not been discussed from the viewpoint of donor-acceptor interaction although it has been shown that compounds of trivalent phosphorus are capable of forming donor-acceptor complexes. Here the results are given of a study of the reaction of ethers of ethylphosphonous acid, with the general formula $\text{C}_2\text{H}_5\text{P}(\text{OR}_2)$, where $\text{R} = \text{C}_1$ to C_8 , with CCl_4 . Thermometric titration curves are presented for solutions of ethylphosphonites in octane by means of carbon tetrachloride. These curves demonstrate that complexes with a 1:1 structure form in the $\text{C}_2\text{H}_5\text{P}(\text{OR}_2) + \text{CCl}_4$ system. Equilibrium and heat of formation constants were derived for these complexes. An equal-equilibrium temperature exists for these complexes in the temperature range of $344 \pm 2^\circ\text{K}$. Various esters of ethylphosphonous acid were produced by reacting ethyldichlorophosphine with the appropriate alcohol in the presence of an acceptor, i.e., hydrogen chloride. The phosphonites produced were purified by boiling in methyl sulfate with metallic sodium. The purity of the product was monitored by the gas-liquid chromatography method, using an LKhM-72 chromatograph. Figures 2; references 11: 8 Russian, 3 Western.
[26-8831]

UDC 541.67:546.185

STRUCTURE OF PHOSPHORANES WITH TRICHLOROMETHYL SUBSTITUENTS FROM DATA OF ^{31}P NMR AND ^{35}Cl NQR SPECTRA

Leningrad ZHURNAL OBRSHCHEY KHIMII in Russian No 10, Oct 80 pp 2230-2233
manuscript received 10 Mar 80

DMITRIYEV, V. I., KOZLOV, E. S., TIMOKHIN, B. V., DUBENKO, L. G. and KALABINA, A. V. Irkutsk State University imeni A. A. Zhdanov Institute of Petro- and Carbon Chemical Synthesis and Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] The results are given of a study of phosphoranes with axially positioned organic substituents. According to the position of frequencies of CCl_3 groups in ^{35}Cl NQR spectra, trichloromethyltetrachlorophosphorane (I), bis(trichloromethyl)-trichlorophosphorane (II), trichloromethyl(o-phenylenedioxy)trichlorophosphorane

(III) and trichloromethyltetraphenoxyphosphorane (IV) in the crystalline state have a trigonal-bipyramidal structure with CCl_3 groups in axial positions. Compounds (III) and (IV) are produced by reacting phosphorane (I) with pyrocatechol and phenol. The state of these phosphoranes in solutions of benzene, nitrobenzene and nitromethane was studied by the ^{31}P NMR method. A study was made at the same time of adducts of compounds (I) to (III) with antimony pentachloride, which have a fixed chlorophosphonium cation. The data demonstrate that in solution compounds (I) to (III) have a pentacovalent structure, as they do in the crystalline form. An increase in polarity of the medium shows a slight influence on the position of chemical shifts of the phosphorus nuclei of these compounds, slightly shifting them into the strong field. On the other hand, for compounds with equatorial organic substituents the shift of the resonance signal is observed toward the weak field. The axial position of the organic substituents prevents destabilization of the trigonal bipyramid of a phosphorane under the effect of a polar solvent, i.e., the separation of a chlorine atom in anion form and the formation of a chlorophosphonium cation. With the existence of two axial organic substituents the ability of a phosphorane to ionize disappears, this ability being associated with the $\text{P}-\text{Cl}_n$ bond. This ability, however, is reflected in the chemical shifts of phosphoranes (II) and (III). It is demonstrated that phosphoranes with trichloromethyl groups at the phosphorus atom in crystalline form and in solutions of differing polarity exist in the un-ionized state. Adducts of phosphoranes with antimony pentachloride exist in polar solvents in the form of organylchlorophosphonium-hexachloroantimonates. References 12: 9 Russian, 3 Western.
[26-8831]

UDC 547.26'118

REACTIONS OF PHOSPHORUS-CONTAINING POLYSULFIDES WITH DIAZO COMPOUNDS, REACTION OF BIS(DIALKOXYTHIOPHOSPHORYL)TRI- AND TETRASULFIDES WITH DIAZOMETHANE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2233-2235
manuscript received 15 Feb 80

KHASKIN, B. A., TOLMACHEVA, N. A., KOROLEVA, T. I. and PROMONENKOV, V. K.,
All-Union Scientific Research Institute of Chemical Agents for Plant Protection

[Abstract] There have hitherto been no studies of reactions of organic tri- and tetrasulfides with diazomethane. The results are given here of a study of the reaction of phosphorus-containing tri- and tetrasulfides with diazomethane. It was demonstrated that in bis(dialkoxythiophosphoryl)tri- and tetrasulfides there occurs the selective addition of a methylene group to the disulfide bond closest to the phosphorus atom. The corresponding bis(dialkoxythiophosphoryl)thiomethylenedisulfides form when bis(dialkoxythiophosphoryl)trisulfides react with a sixfold excess of diazomethane. The yield in this case is quantitative. The addition of a single

methylene group has been proven by PMR spectroscopy. A higher excess of diazomethane results in breaking of the polysulfide chain. When bis(dialkoxythiophosphoryl)tetrasulfides react with diazomethane a mixture of addition products forms, both at the first and two closest disulfide bonds to the phosphorus atom. The products of the addition of a methylene group to phosphorus-containing tri- and tetrasulfides are in the form of undistilled oils. References: 4 Russian. [26-8931]

UDC 547.362:547.818

SYNTHESIS OF DIALKYLPHOSPHONOETHINYLCYCLOHEXENES, 2,2-DIMETHYL-4-DIALKYLPHOSPHONOETHINYL- Δ^4 -DIHYDROPYRANS, 2,2-DIMETHYL-4-DIALKYLPHOSPHONOETHINYL- Δ^4 -DIHYDROTHIOPYRANS AND 1,2,5-TRIMETHYL-4-DIALKYLPHOSPHONOETHINYL- Δ^4 -DEHYDROPIPERIDINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2236-2238
manuscript received 11 Jun 79

YAGUDEYEV, T. A., KUSHEMBAYEV, R. K., NURGALIYEVA, A. N., ZHUMAGALIYEV, B.,
DZHAKIYAYEV, G. M. and GODOVIKOV, N. N., Kazakh SSR Academy of Sciences Institute
of the Chemistry of Oil and Natural Salts and USSR Academy of Sciences Institute of
Hetero-Organic Compounds

[Abstract] It has been found that ethers of ethynylphosphonic acids containing cyclohexene, dihydropyran, dihydrochiopyran and dehydropiperidine groups can be synthesized by reacting lithium aluminum complexes produced from lithium aluminum hydride and the appropriate substituted acetylenes with dialkylchlorophosphates. This reaction takes place under relatively gentle conditions in a medium of pyridine in an atmosphere of inert gas without separating the acetylene complexes. Yields of 60 to 80 percent of phosphorylation products are produced. IR and PMR spectroscopy data which confirm the structure of some of the substances produced are presented. Dialkylphosphonoethinylcyclohexenes were produced by adding in drops a solution of 0.08 mole of ethinylcyclohexene in 25 ml of pyridine to a solution of 0.02 mole of lithium aluminum hydride in 50 ml of pyridine while stirring in a flow of inert gas. The reaction mixture was then heated to the boiling point of the solvent for the purpose of totally separating the hydrogen. Then 0.08 mole of dialkylchlorophosphate was added at 0°C, the mixture was heated to 105°C and held at this temperature for 5 h and then while cooling it was separated with a five-percent solution of hydrochloric acid and extracted with ether, the solvent was removed and the residue was distilled under reduced pressure. 2,2-dimethyl-4-dialkylphosphonoethinyl- Δ^4 -dihydropyrans were produced by adding 0.08 mole of dialkylchlorophosphate in 25 ml of pyridine to a solution of an organic lithium aluminum complex produced from 0.02 mole of lithium aluminum hydride and 0.08 mole c. 2,2-dimethyl-4-ethinyl- Δ^4 -dihydropyran in 50 ml of pyridine. The mixture was then heated to the boiling point and was held at this temperature for 7 h and was

then cooled to room temperature. 2,2-dimethyl-4-dialkylphosphonoethynyl- Δ^4 -dihydrothiopyrans and 1,2,5-trimethyl-4-dialkylphosphonoethynyl- Δ^4 -dehydropiperidines were produced in a similar manner. References: 2 Russian.
[26-8831]

UDC 547.26'118

SOME HEXAALKYLTRIAMINOPHOSPHONIUM YLIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2239-2242
manuscript received 6 Jun 78

MIZRAKH, L. I., POLONSKAYA, L. Yu., BABUSHKINA, T. A. and IVANOVA, T. M.

[Abstract] It has been demonstrated that hexaethyltriamino-N,N-diethylcarbamoylmethylenephosphorane (II) can be produced by treating hexaethyltriamino-N,N-diethylcarbamoylmethylphosphonium chloride (I) with a hydrous alkali. To 3.74 g of compound (I) is added 0.38 g of NaOH in the form of a 20-percent aqueous solution, stirring is performed in an atmosphere of nitrogen at 20 to 25°C for 20 min, the reaction mixture is extracted with ether, the extract is dried with $MgSO_4$, the ether is removed and the residue is fractionated under vacuum. A 66-percent yield of compound (II) is produced, weighing 2.03 g. It has a boiling point of 82 to 84°C at 0.025 mm Hg. It is also possible to add 30 ml of 50-percent aqueous KOH to 4.77 g of compound (I), stir the mixture in an atmosphere of nitrogen for 4 h at 140°C and to separate compound (II) in a manner similar to that described. Ylide (II) is very stable and is preserved when heated for 4 h with 50-percent KOH to 140°C. When (II) is reacted with 4-nitrobenzaldehyde, the N,N-diethylamide of 4-nitrocinnamic acid (III) forms. The N,N-diethylamide of cinnamic acid (IV) was produced in a similar manner by using benzaldehyde. When hexaethyltriamidophosphite is subjected to a Wittig ether rearrangement products are formed which contain a diethylamide group, whereas in the case of hexamethyltriamidophosphite products which preserve the complex ether group are obtained. This difference is observed in reactions with alkylchloroacetals. References 7: 3 Russian, 4 Western.
[26-8831]

INTERACTION OF THIOUREA WITH HEXAALKYLTRIAMINOPHOSPHONIUM SALTS

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian No 10, Oct 80 pp 2242-2246
manuscript received 9 Feb 79

MIZRAKH, L. I., POLONSKAYA, L. Yu., BABUSHKINA, T. A., ULANOVSKAYA, N. V. and
IVANOVA, T. M.

[Abstract] It has been demonstrated that halides of hexaalkyltriaminophosphonium salts are able to form complexes with thiourea. These complexes are able to enter into reactions characteristic both of the salts and of the thiourea in the individual state. The complexes are formed by the following two methods: 1) A mixture of the individual phosphonium salt and thiourea in a molar ratio of 1:1.8 is heated to 140 to 150°C while stirring for 30 to 40 min, is then cooled, the hardened mass is pulverized in benzene and the crystals formed are recrystallized from a mixture of benzene and alcohol or ether and acetone. 2) A mixture of the individual phosphonium salt and thiourea in a molar ratio of 1:1.8 is heated in a solution of ethanol for 30 min at 50°C, the solvent is removed and the residue is washed with benzene and recrystallized from a mixture of benzene and alcohol or ether and acetone. It has been demonstrated that thermolysis of a complex of hexaethyltriaminobenzylphosphonium chloride and thiourea results in hexaethyltriaminobenzylphosphonium thiocyanate. IR spectroscopy data on these complexes make it possible to conclude that the nitrogen atoms of the thiourea do not participate directly in coordination and that the bond with the phosphonium salt is accomplished through the sulfur atom. This is confirmed indirectly by the fact that it was not possible to produce the individual complexes by reacting hexaalkyltriaminophosphonium salts with urea. The ability of hexaalkyltriaminophosphonium salts to form complexes with thiourea does not depend on the nature of the R' substituent. The electrophilic phosphorus atom takes part in coordination in the case of hexaethyltriaminobenzylphosphonium chloride and the nature of the anion, unlike that of R' substituents, influences complex formation. When hexaethyltriaminobenzylphosphonium chloride (Ia) is heated with an equimolar amount of thiourea to the point of total melting of the reaction mass, a complex with a 1:2 composition (IIa) forms. Along with product (IIa) phosphonium salt (Ia) is produced in the excess. If equimolar quantities of salt (Ia) and thiourea are heated above 150°C the complex (IIa) which forms reacts with the excess phosphonium salt and hexaethyltriaminobenzylphosphonium thiocyanate (III) forms. References 6: 2 Russian, 4 Western.

[26-8831]

REACTIONS OF (2,2-DICHLORO-1-ACYLAMINOVINYL)TRIPHENYLPHOSPHONIUM CHLORIDES WITH NUCLEOPHILIC REACTANTS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2248-2257
manuscript received 18 Mar 80

LOBANOV, O. P., MARTYNYUK, A. P. and DRACH, B. S., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] The results are given of a study of substituted vinyl phosphonium salts of the type $\text{Cl}_2\text{C}=\text{C}(\text{NHCOR})\text{P}^+(\text{C}_6\text{H}_5)_3\text{Cl}^-$ (I), which are produced with a high yield from such simple substances as chloral, amides of carbonic acids and triphenyl phosphine. Salts (I) are interesting polyfunctional electrophilic reagents possessing very high and varied reactivity. They react quickly with many nucleophilic reagents such as alcoholates of sodium, thiophenols in the presence of triethylamines, sodium hydro-sulfide and aliphatic and aromatic amines, even under gentle conditions. The direction of these reactions depends essentially on the nature of the nucleophilic reactants. "Soft" nucleophilic reactants such as HS^- , ArS^- and ArNH_2 react quickly with the dichlorovinyl group of these salts at the very first stages of condensation, whereas the "hardest" nucleophilic reactants such as HO^- and AlkO^- detach a proton from the amide radical of salts (I) and do not react with the chlorine atoms at the $\text{C}=\text{C}$ bond, at least at first. Two alternative structures are suggested for the products of detachment of hydrogen chloride from phosphonium salts (I): mesomeric betaines (II), and cyclic phosphoranes (III). Betaines (II) are rather high-melting crystalline substances which are soluble in polar solvents and which easily form rather strong solvates with water, benzene, nitrobenzene and other solvents. A number of mesomeric betaines containing phosphorus can be produced in the reactions described. 4,4-dichloro-1-oxido-3-triphenylphosphonium-1-aryl-2-aza-1,3-butadienes (II) are produced as follows: To a solution of 0.01 mole (2,2-dichloro-1-benzoylamino vinyl)triphenylphosphonium chloride (Ia) in 15 to 20 ml of absolute methanol is added a solution of 0.0105 mole of sodium methylate in 5 ml of methanol, the mixture is held for 3 to 4 h at 20 to 25°C, the sodium chloride is filtered off, two thirds of the methanol is removed under vacuum, the residue is mixed with 20 ml of absolute ether and after several hours the betaine (II) is filtered off and is then cleaned by reprecipitation from methanol by means of ether. Previously unknown types of phosphorylated thiazoles and oxazoles are produced by the alkylation of these betaines. These include such compounds as 5-thioxo-2-aryl-4H-thiazolidenetriphenylphosphoranes and (5-N-methyl-N-arylamino-2-phenyl-4-oxazolyl)triphenylphosphonium iodides. References 9: 7 Russian, 2 Western.

[26-8831]

REACTION OF 1-BROMADAMANTANE WITH TRIPROPYL PHOSPHITE

Leningrad *ZHURNAL OBSHCHEY KHIMII* in Russian No 10, Oct 80 p 2378
manuscript received 15 Apr 80

KUKHAR', V. P., GAMALEYA, V. F., SOROCHINSKIY, A. Ye., ALEKBANDROV, A. M. and
PAVLENKO, A. P., Ukrainian SSR Academy of Sciences Institute of Organic Chemistry

[Abstract] It has been discovered that 1-bromadamantane when reacted with tripropyl phosphite takes part in an Arbusov rearrangement and results in the formation of 1-adamantyl phosphorylated derivatives. When phosphorus pentachloride is added to this reaction mixture (I) the dichloranhydride (II) forms and hydrolysis of this produces adamantylphosphonic acid (III). Acid (III) was produced by heating for 12 hr at 18° to 195°C 0.04 mole of 1-bromadamantane and 15 ml of tripropyl phosphite in a packed column furnished with a reflux condenser. To reaction mixture (I) was added 0.04 mole of phosphorus pentachloride and the mixture was held at 150°C for 8 h. The volatile products were removed under vacuum and the residue was hydrolyzed by means of hydrochloride acid and acid (III) was produced with a yield of 60 percent and a boiling point of 305 to 308°C. Compound (II) was produced by reacting phosphorus pentachloride with reaction mixture (I) or acid (III) with a respective yield of 67 and 95 percent and a boiling point of 101 to 102°C. References 3: 2 Russian, 1 Western.

[26-8831]

UDC 547.464.7+547.468

REACTIONS OF CHLORODICYANOETHYLENES WITH TRIALKYL PHOSPHITES AND TRIPHENYL PHOSPHINE

Leningrad *ZHURNAL OBSHCHEY KHIMII* in Russian No 10, Oct 80 pp 2379-2380
manuscript received 22 Apr 80

PAVLENKO, N. G., SAGINA, Ye. I. and KUKHAR', V. P., Ukrainian SSR Academy of
Sciences Institute of Organic Chemistry

[Abstract] Chlorodicyanoethylenes were reacted with trialkyl phosphites and triphenyl phosphine for the purpose of synthesizing and studying the properties of phosphorus-containing analogs of tetracyanoethylene. Dicyanovinylphosphonates (I) are formed when 1-chloro-2,2-dicyanoethylene reacts with trialkyl phosphites at 0 to 5°C in a benzene solution. When 1,1-dichloro-2,2-dicyanoethylene reacts with trialkyl phosphites under similar conditions 1,1-bis(dialkoxyphosphonyl)-2,2-dicyanoethylenes (II) form. When chlorodicyanoethylene reacts with triphenyl

phosphine (2,2-dicyanovinyl)triphenylphosphonium chloride (III) forms. Dichloro-cyanoethylene under the same conditions produces (2,2-dicyanovinyl)bis-triphenyl-phosphonium dichloride (IV) with a reactant ratio of either 1:1 or 1:2. The hydrolysis of salts (III) and (IV) results in breaking of the carbon-phosphorus bond and in the formation of triphenylphosphine oxide. Under the effect of silver nitrate the chlorine anion in phosphonium salt (III) is easily substituted by a nitrate anion. Compounds (I) include 1-diethoxyphosphonyl-2,2-dicyanoethylene (Ia) and 1-di(isopropoxyphosphonyl)-2,2-dicyanoethylene (Ib) and (II) include 1,1-bis-(diethoxyphosphonyl)-2,2-dicyanoethylene (IIa). References: 2 Western.
[26-8831]

UDC 547.26'118

OXYARYLALKYLAMIDOPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2380-2381
manuscript received 21 Apr 80

ZOLOTOV, M. A., FREDVODITELEV, D. A. and NIPANT'YEV, E. Ye., Moscow Pedagogical Institute imeni V. I. Lenin

[Abstract] It has been demonstrated that 4-(γ -oxypropyl)-2,6-di-ter-butylphenol (I) and the hexaethyltri-*amide* of phosphorous acid in a molar ration of 1:3 at 70°C form a hydroxyl-containing diamidophosphite (II) with a yield of 65 percent. Compound (II) is completely stable and can be purified by vacuum distillation. Also formed in this reaction is a slight quantity of an amidophosphite (III) with a yield of four percent. This represents the first published data on a study of these bifunctional derivatives. Diamidophosphite (II) phosphorylates alcohols to form benzyl- γ -(4-oxy-2,6-di-ter-butylphenyl)propyl-N,N'-diethylamidophosphite (IV). This reaction begins at 20°C. Amidophosphites (II) to (IV) are oxidized normally, combine with sulfur and enter into other reactions characteristic of derivatives of trivalent phosphorus. Compound (II) has been identified as γ -(4-oxy-2,6-di-ter-butylphenyl)propyl-N,N'-tetraethyldiamidophosphite and compound (III) as bis[γ -(4-oxy-2,6-di-ter-butylphenyl)propyl]-N,N'-diethylamidophosphite.
References: 3 Russian.
[26-8831]

INTERACTION OF PHOSPHORUS PENTACHLORIDE WITH DIALLYL ACETAL

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2381-2382
manuscript received 22 Mar 80

KORMACHEV, V. V., MITRASOV, Yu. N. and KUKHTIN, V. A.,
Chuvash State University imeni I. N. Ul'yanov

[Abstract] It has been demonstrated that when diallyl acetal reacts with phosphorus pentachloride under mild conditions a heavy crystalline adduct forms and that when this adduct is treated with sulfur dioxide or hydrogen sulfide dichloranhydrides of 2-allyloxyvinylphosphonic(-thiophosphonic) acids form. Hitherto there have been no published data on the interaction of phosphorus pentachloride with acetals of unsaturated alcohols. The dichloranhydride of 2-allyloxyvinylphosphonic acid with a formula of $C_5H_7Cl_2O_2P$ is arrived at with a yield of 74 percent and has a boiling point of 99 to 100°C under 3 mm Hg. The dichloranhydride of 2-allyloxyvinylthiophosphonic acid is obtained with a yield of 64 percent and has a boiling point of 97 to 97.5°C under 3 mm Hg. Its formula is $C_5H_7Cl_2OPS$. The structure of the dichloranhydrides formed was confirmed by means of IR and NMR 1H and ^{31}P spectroscopy.

[26-8831]

REACTION OF TRIETHYL PHOSPHITE WITH ISONITROSOACETONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2382-2383
manuscript received 31 Mar 80

OSIPOVA, M. P., LUKIN, P. M. and KUKHTIN, V. A.,
Chuvash State University imeni I. N. Ul'yanov

[Abstract] As a continuation of research on reactions of trialkyl phosphites with nitrogen-containing conjugated systems, the results are given of a study of the interaction of triethyl phosphite with isonitrosoacetone with an $O=C-C=O$ conjugation system. Triethyl phosphite reacts exothermically with isonitrosoacetone to form a 1:1 adduct. The data of an elemental analysis and the presence in the adduct of a CO group demonstrate that the interaction takes place not through the conjugated system but through the oxime group and begins with the attack of the phosphorus atom on the electrophilic carbon atom of the oxime group to form O,O-diethyl- α -(O-ethylhydroxylaminoacetyl-methyl)-phosphonate (I). Compound (I) was

produced by adding dropwise over a period of 2 h 20 g of triethyl phosphite to 10.46 g of isonitrosoacetone in an atmosphere of nitrogen. Heating of the reaction mixture to 70°C was observed along with a change in color from light yellow to dark cherry red. The mixture was then heated for 3 h at 80°C and by vacuum distillation phosphonate (I) was separated in a quantity of 14.7 g with a yield of 49 percent, with a boiling point of 72 to 74°C at 1 mm Hg. The formula of this compound is $C_9H_{20}O_5P$. When phosphonate (I) is acylated by means of acetyl chloride the corresponding acetyl derivative forms. References: 1 Russian. [26-8831]

UDC 547.442.5'279.1+546.181.1

REACTION OF 2,2'-DICYCLOHEXANONYLSULFIDE WITH PHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2384-2385
manuscript received 1 Apr 80

KOSTIN, V. G., KARAULOV, Ye. S. and TILICHENKO, M. N.,
Far Eastern State University

[Abstract] It has been found that 2,2'-dicyclohexanonylsulfide (I) reacts with phosphine to form a P-oxide of 4a-hydroxy-9-thia-10-phosphaperhydroanthracene (II). Compound (II) is oxidized by hydrogen peroxide into the corresponding acid (III). Acid (III) is easily methylated by means of diazomethane to form two isomeric methyl ethers (IVa,b) which differ in the position of the methoxy group in relation to the thiaphosphorinane ring. There have hitherto been no published data describing the reaction of 3-thia-1,5-diketones with phosphine. The composition and structure of compounds (II) to (IVa, b) were confirmed by IR, mass and PMR spectroscopy and by elemental analysis. From 0.1 mole of diketone (I), 25 g of magnesium phosphide and 180 ml of concentrated HCl are produced by a method described in an earlier study (1975) 7.8 g of a crystalline product and after repeated recrystallization of this product from ethanol oxide (II) is produced with a boiling point of 221 to 222°C. Compound (III) was obtained by boiling for 8 h a solution of 0.013 mole of oxide (II) in 150 ml of MeOH and 20 ml of 30-percent H_2O_2 , after which the solvent was concentrated by evaporation. The yield of the product was 87 percent with a boiling point of 278 to 279 °C. A mixture of isomeric methyl ethers (IVa) and (IVb) was produced with a yield of 90 percent from 0.01 mole of dioxide (III) and an ether solution of diazomethane. The two ethers were separated by means of preparative thin-layer chromatography with silica gel as the absorbent and $CHCl_3$ -MeOH as the eluant. Isomer (IVa) is in the form of colorless prisms with a boiling point of 260 to 261°C, and isomer (IVb) of colorless prisms with a boiling point of 243 to 244°C. References: 1 Russian. [26-8831]

SYNTHESIS OF SOME PHOSPHORUS-CONTAINING DI- AND TETRAHYDROPYRANS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian No 10, Oct 80 pp 2386-2387
manuscript received 5 Apr 80

GAZIZOV, M. B., RAZUMOV, A. I. and GIZATULLINA, I. Kh.,
Kazan' Chemical Technology Institute imeni S. M. Kirov

[Abstract] It has been found for the first time that the addition of dialkyl-8-chloromonothiophosphates to dihydropyran under mild conditions results in 2-chlor-3-dialkylmonothiophosphone tetrahydropyrans (I). Compounds (I) are highly reactive and poorly stable. When compounds (I) react with trialkyl phosphites and triethylamines the elimination of the hydrogen chloride takes place and 3-dialkylmonothiophosphone dihydropyrans (II) are formed. When compounds (I) react with alcohols nucleophilic substitution of the chlorine atom by an alkoxy radical takes place and cyclic acetals are formed, i.e., 2-alkoxy-3-dialkylmonothiophosphone tetrahydropyrans (III). Compounds (III) were identified in unpurified form, for they evidence poor thermal stability and under distillation the alcohol is partly detached and a mixture of products (II) and (III) forms. Prolonged heating of (III) at 130°C results in individual product (II). Under the effect of compounds (I) trialkyl phosphates are not at all subjected to Arbuzov rearrangement. This is explained by the enhancement of the mobility of the hydrogen atom in the 3 position under the influence of the electron-acceptor dialkylmonothiophosphone group. The structure and composition of compounds (II) and (III) were confirmed by IR and NMR spectroscopy and by elemental analysis.
[26-8831]

HYDROGEN ISOTOPE EXCHANGE OF BENZENECHROMODICARBONYLDIPHENYLFERROCENYLPHOSPHINE IN BOTH ACIDIC AND BASIC ENVIRONMENTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 255, No 4, 1980 pp 883-885
manuscript received 16 May 80

LOSILKINA, V. I., BARANETSKAYA, N. K., VIL'CHEVSKAYA, V. D., TOLKUNOVA, V. S., SETKINA, V. N. and KURSANOV, D. N., foreign correspondent of the USSR Academy of Sciences, Institute of Heteroatom Organic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] This study is part of a continuing program to examine the effects of different ligand- (L) on the properties and reactivity of π -arenechromocarbonyl

complexes. The H_2 isotopic exchange studies were performed in order to confirm the proposition that the phenylferrocenylphosphine ligands are stronger donors than the PPh_3 ligand. The rate of the isotopic exchange reactions of the π -benzene ring in EtOD in the presence of EtONa (2.7×10^{-7}) was about 40 times less than that of the benzenechromotricarbonyl (132×10^{-7} for $L=CO$) and about 2 times less than that for triphenylphosphine (6.1×10^{-7} for $L=PPh_3$). Data from the exchange reaction carried out in an acidic environment indicate that the isotopic exchange occurs for the hydrogens not only in the π -benzene ring but also in the π -cyclopentadienyl rings of the diphenylferrocenylphosphine ring. The hydrogen atoms in the middle ring of the diphenylferrocenylphosphine which coordinate with the Cr atom exchange about three orders of magnitude faster than those of the uncoordinated phosphine. Tables: 3; references: 5 Russian.
[54-12027]

UDC 541.64:547.1.128

STUDY OF THE INTERACTION OF DIORGANOPHOSPHINIC ACIDS WITH TRIS (ORGANOSILOXYDIHYDROXY)-SUBSTITUTED METALS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 3-8
manuscript received 1 Apr 80

SHAPKIN, N. P. and SHCHEGOLIKHINA, N. A., Dal'nevostochnyy Polytechnic Institute

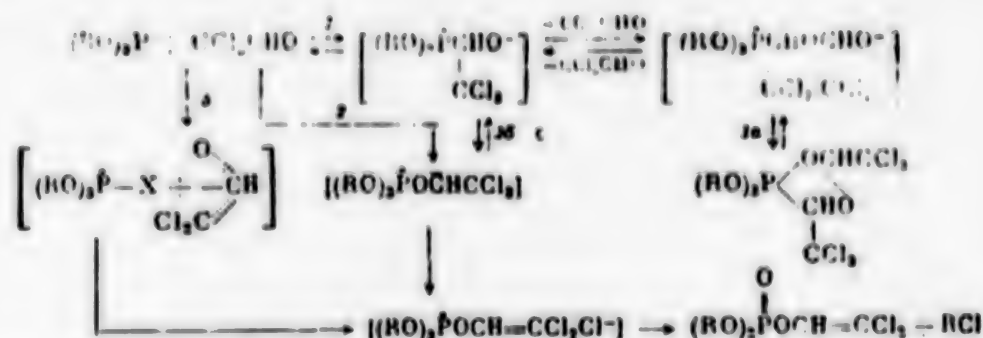
[Abstract] The title study was carried out for the following compounds: metals—chromium and iron; radicals in the phosphonic acids -butyl, -nonyl, and -phenyl; radicals on the silicon--butyl and phenyl. The resulting polymeric product for each of the twelve reactions was separated into thirteen fractions by gel permeation chromatography, covering a molecular weight range of up to 10,000. The weight % distribution curve showed a bimodal distribution with modal amounts of material at about 5000 and a secondary mode about 1000 MW. The polymeric structures were formed by a combination of two processes: 1, the heterocondensation between the hydroxyl groups of the phosphinic acids and the organosilanyl-substituted metals and 2, the cleavage of the Si-O-M group under the influence of the phosphinic acids. The extent of cleavage is a function of the strength of the phosphinic acids which always followed the order: $P(C_9H_{19})_2(O)OH < P(C_4H_9)_2(O)OH < P(C_6H_5)_2P(O)OH$. Figures 2; tables 3; references 14: 5 Russian, 9 Western.
[62-12027]

MECHANISM OF THE PERKOV REACTION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 8-11
manuscript received 1 Feb 80

GAZIZOV, T. Kh., SUDAREV, Yu. I., KIBARDYN, A. M., BELYALOV, R. U. and
PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
Kazan' Branch, USSR Academy of Sciences

[Abstract] On the basis of previous work, it was assumed that the reaction of trialkylphosphites with chloral starts with an attack by the P atom on the carbonyl carbon (reaction 1). Since reaction



1a is reversible, then it may be proposed that is an attack by a P atom on a carbonyl carbon is required for the formation of products with a P-C bond, then the formation of vinyl phosphates is brought about by the attack of the P atom on the carbonyl oxygen of the chloral (reaction 2) or by the halide atom (reaction 3). In order to establish the pathway, the compounds diethyl- α -trimethylsiloxy- β,β,β -trichloroethylphosphonate and dibutyl- α -trimethylsiloxy- β,β,β -trichloroethylphosphonoxide were heated resulting in the formation of diethyl- β,β -dichlorovinylphosphate and dibutyl- β,β -dichlorovinylphosphinate. This established the bipolar ion as the intermediate (reaction 1b). References 9: 7 Russian, 2 Western; figures 4.

[62-12027]

EXCHANGE REACTIONS IN A SERIES OF P(III) DERIVATIVES. FEATURES OF THE EXCHANGE IN A SERIES OF PHOSPHONOUS DERIVATIVES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 11-19
manuscript received 14 Feb 80

AL'FONSOV, V. A., ZAMALETDINOVA, G. U., BATYYEVA, E. S. and PUDOVIK, A. N.,
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
Kazan' Branch, USSR Academy of Sciences

[Abstract] A study was made of the reactivity of compounds containing the group P-E-R (where E is a heteroatom: nitrogen, sulfur, or oxygen), particularly the reaction of the chlorides of 1,2-alkylenephosphorous acids with esters and amides of phosphinous acids. Analogous reactions were carried out with substituted 1,2-ethyleneglycolphosphorous acids, however the product was unstable. Acyclic diethylchlorophosphites also react with the ethyl ether and the diethylamine of ethylphenylphosphinous acid forming a product with a P-P bond. NMR ^{31}P spectra indicated that the initial process at higher temperatures (60°C) was the acid-catalyzed exchange of ligands and only after the mixture had been cooled to room temperature did the final product containing the P-P bond form. With regard to ligands, the most nucleophilic substituent always migrated to the most electrophilic P atom. During a study of the shifting of amido moieties among the different P(III) compounds, it was shown that the triamidophosphite easily loses an amide group to ethylphenylchlorophosphine, however, the amide of ethylphenylphosphonous acid group also easily exchanges an amide for a chloride in the diethylchlorophosphite. References 17: 10 Russian, 7 Western; Figures 3; Tables 1. [62-12027]

STUDY OF THE ROTATIONAL ISOMERS OF O,O-DIMETHYL-S-TRIMETHYLSILYLDITHIOPHOSPHATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 19-23
manuscript received 12 May 80

SPAGIDULLIN, R. R., PATSANOVSKIY, I. I., SHAKIROV, I. Kh., ISHMAYEVA, E. A.,
KUTYREV, G. A., KUTYREV, A. A. and PUDOVIK, A. N., Kazan' State University imeni
V. I. Ul'yanov-Lenin, Institute of Organic and Physical Chemistry imeni
A. Ye. Arbuzov and Kazan' Branch, USSR Academy of Sciences

[Abstract] The title study was carried out using Ramon spectroscopy and dipolar moment studies around the P-S-Si(Me)₃ bond. The investigations were made at different temperatures in liquid and crystalline samples, and also as solutions of the

phosphate in solvents of differing polarities. The Ramon spectra show two lines for the $\text{P-S-Si(CH}_3)_3$ at 497 cm^{-1} and 528 cm^{-1} . The change in the intensity of the lines with changing experimental conditions allows the assignment of the $\nu = 528\text{ cm}^{-1}$ to the gauche form and that at 497 cm^{-1} to the trans configuration. The difference in energy between the two forms is ca. 0.7 kcal/mole . The ratio of gauche to trans at room temperature ($+19^\circ\text{C}$) is 55:45. More detailed investigation of the lines indicated that they were doublets, particularly the one at 528 cm^{-1} . The slight difference in energy levels is caused by the relative stereochemistry of the methyl group attached to each of the two oxygen atoms. The lower-frequency component is related to the tg_1g_2 configuration which is somewhat more polar than the tg_1g_1 . The dipole moments for the ten possibilities ranged from 2.54 to 4.53. References 21: 13 Russian, 8 Western; Figures 5; Tables 1. [62-12027]

UDC 547.26'118+547.442.2

THE REACTION OF PHOSPHOROUS ACID ESTERS WITH PHOSPHONOUS TRIHALIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 24-28
manuscript received 9 Jun 80

BELYALOV, R. U., KIBARDIN, A. M., GAZIZOV, T. Kh. and PUDOVIK, A. N.,
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
Kazan' Branch, USSR Academy of Sciences

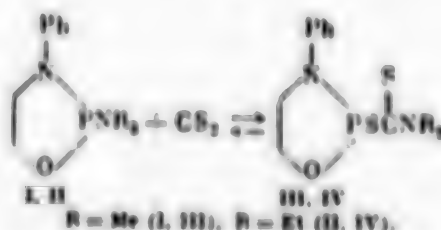
[Abstract] P^{31} -NMR was used to study the reaction of $(\text{PrO})_3\text{P}$ with PCl_3 and PROPCl_2 , $(\text{PrO})_2\text{PCl}$ and $(\text{PhO})_3\text{P}$ with PCl_3 , $(\text{PrO})_3\text{P}$ with PBr_3 , and Bu_2POBu with $(\text{PrO})_2\text{PCl}$, PCl_3 , and PBr_3 . The reactivity of the PX_3 towards the trialkyl phosphites follows the trend $\text{PF}_3 < \text{PCl}_3 < \text{PBr}_3 < \text{PI}_3$. The disproportionation for the reactions $(\text{PrO})_2\text{PCl}$ with PCl_3 , and $(\text{PrO})_3\text{P}$ with PROPCl_2 occurs with much more difficulty than for the reaction $(\text{PrO})_3\text{P}$ with PCl_3 . The exchange of the phenoxy group in $(\text{PhO})_3\text{P}$ for Cl in PCl_3 is more difficult than that for alkoxy groups. These reactions proceed through an intermediate in which the P of the PX_3 is coordinated with the O of the P-O-R moiety and can be catalyzed by both acids and bases. The increase in reaction rate from $\text{X} = \text{F}$ to $\text{X} = \text{I}$ is consistent with this mechanism. Heating $(\text{MeO})_3\text{P}$ in the presence of 0.5 molar PCl_3 at 230°C for 1.5 hours results in the complete isomerization to the product MeP(O)(OMe)_2 . References 12: 5 Russian, 7 Western; Figures 3; Tables 1. [62-12027]

REACTION OF 1,3,2-OXAZA- AND DIAZAPHOSPHOLANES WITH HYDROGEN SULFIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 28-34
manuscript received 19 Jun 80

PUDOVIK, M. A., KIBARDINA, L. K., ALEKSANDROVA, I. A., KHAYRULLIN, V. K. and
PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
Kazan' Branch, USSR Academy of Sciences

[Abstract] The reaction of 2-dialkylamino-3-phenyl-1,3,2-oxazaphospholanes with CS_2 proceeds with the insertion of the CS_2 across the P-N bond as follows:



The reaction of (III) with sulfur yields two products: 2-dimethylamino-2-thioxy-3-phenyl-1,3,2-oxazaphospholane and 2-(N-dimethylthiocarbamoylthio)-2-thioxy-3-phenyl-1,3,2-oxazaphospholane. The interaction of 2-(N-dialkylthiocarbamoylthio)-1,3,2-oxazaphospholanes with proton-donor reagents (alcohols, amines) proceeds by breaking the P-S bond and the subsequent formation of the corresponding 2-alkoxy- or 2-dialkylamino-1,3,2-oxazaphospholanes. The 1,3,2-diazaphospholanes, having an exocyclic P-C bond, react with CS_2 forming a product with a bipolar configuration at the P atom. CS_2 reacts with 2-diethylamino-4,5-benzo-1,3,2-oxazaphospholane by addition across the exocyclic P-N bond, resulting in the product trans-(N,N-diethyldithiocarbamate-S,S)phosphorous. References 4: 2 Russian, 2 Western; Figures 8; Tables 1.

[62-12027]

IRREGULAR PERMUTATIONAL ISOMERIZATION OF SPIRO-1,2-OXAPHOSPHOL-4-ENES

Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 34-40
manuscript received 12 Jun 80

RAGULIN, V. V., ZAKHAROV, V. I., PETROV, A. A. and RAZUMOVA, N. A.,
Leningrad Technological Institute imeni Lensevet

[Abstract] The title compounds were prepared by the condensation of some dioxaphospholane derivatives of trivalent phosphorus with benzylideneacetylacetone. Structural information obtained by using infrared spectroscopy and ^1H , ^{31}P and ^{13}C together with double ^1H -(^{31}P) nuclear magnetic resonance (NMR) indicated a trigonal-bipyramidal structure for the spirophosphoranes. The product is a mixture of the diastereomers, the syn-X/Ph configuration being kinetically favored and the anti-X/Ph configuration thermodynamically favored. An increase in the anti-X/Ph with time supports the irregular permutational isomerization and the presence of ionic spirophosphoranes in the solution. The existence of thermodynamic disequilibrium in the diastereomer mixture suggests a synchronous reaction mechanism for the 1,4-ring addition. References: 7 Western; Figures 5; Tables 5.
[62-12027]

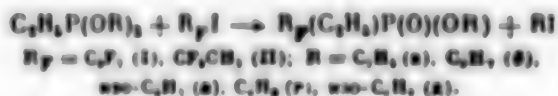
UDC 547.241

REACTION OF PERFLUOROIDOALKANES WITH ESTERS OF PHOSPHOROUS ACIDS

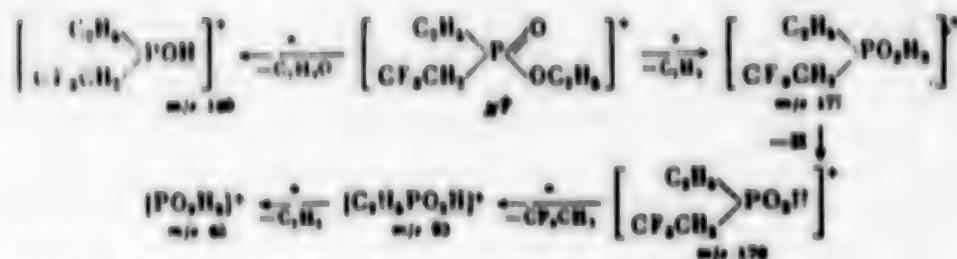
Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 41-46
manuscript received 26 May 80

GARABADZHIU, A. V., RODIN, A. A., LAVRENT'YEV, A. N. and SOCHILIN, Ye. G.,
Leningrad Technological Institute imeni Lensevet

[Abstract] The title reaction, based on the Arbuzov rearrangement, was carried out for the following compounds:



The reactions proceed with the formation of some resinous products which makes the separation of the product esters difficult. Structures were established using ^1H , ^{19}F , and ^{31}P NMR and mass spectrometry. The fragment-forming mechanism for compound Ia is shown below:



References 10: 8 Russian, 2 Western; Figures 2; Tables 3.
[62-12027]

UDC 547.241

REACTION OF ALKYL HALIDES WITH ETHYLPHOSPHONOUS ACID ESTERS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 46-48
manuscript received 9 Jun 80

KRUTIKOV, V. I., LAVRENT'YEV, A. N. and MASLENNIKOV, I. G.,
Leningrad Technological Institute imeni Lenolet

[Abstract] The alkyl halides CHCl_3 , CH_2Cl_2 , CCl_3Br and CCl_3CCl_3 were reacted with esters having the composition $\text{C}_2\text{H}_5\text{P}(\text{OR})_2$ for $\text{R} = \text{C}_2\text{H}_5$, $\text{iso-C}_3\text{H}_7$, C_3H_7 , $\text{iso-C}_4\text{H}_9$, C_4H_9 , C_5H_{11} , and C_6H_{13} . The reaction was followed by a calorimetric (thermal) titration. The resulting data indicate that CHCl_3 and CH_2Cl_2 form 1:1 complexes with the ethers but that CCl_3Br and CCl_3CCl_3 do not, probably because of spatial limitations. The $\lg K$ was linearly dependent on the induction σ_I^Φ and resonance σ_R^Φ , as given by the equations

$$\lg K = 1.008 - 0.752\sigma_I^\Phi - 0.124\sigma_R^\Phi + 0.082 \quad (1)$$

$$\lg K = 2.105 - 0.752\sigma_I^\Phi - 0.234\sigma_R^\Phi + 0.076 \quad (2)$$

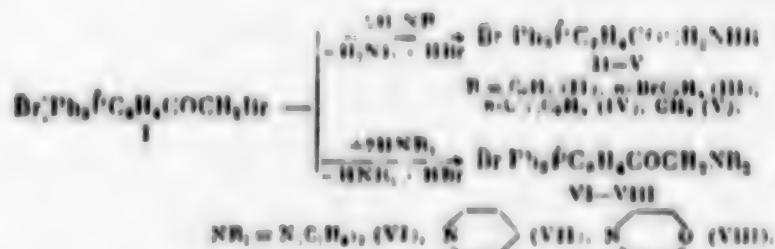
for the reactions involving CCl_4 and CHCl_3 respectively. References 8:
6 Russian, 2 Western; Figures 2; Tables 1.
[62-12027]

REACTION OF ω -HALOACYLPHOSPHONOUS SALTS WITH AMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 48-54
manuscript received 26 Feb 80

DUKACHUK, O. M., MEGERA, I. V. and SHEVCHUK, M. I., Chernovitskiy State University

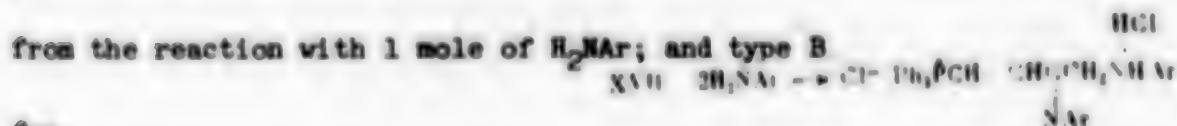
[Abstract] Primary, secondary, and tertiary amines reacted with p -(triphenylphosphoniobromide)bromophenacetyl (I) to form the triphenylphosphony-substituted phenacylamines as follows:



Two new styryls containing the phosphoniquinoline group were synthesized by reacting quinaldine or tetraphenylfuran with (I). Particulars, such as temperature, ratios of reagent concentrations, and base strength of the amine, were established for the reaction of β -chloroacetylvinyltriphenylphosphoniobromides with primary amines. The reaction can result in two different products:



for $\text{Ar} = \text{C}_6\text{H}_5 \text{ (XIX), } p\text{-BrC}_6\text{H}_4 \text{ (XX), } m\text{-ClC}_6\text{H}_4 \text{ (XXI), } p\text{-NO}_2\text{C}_6\text{H}_4 \text{ (XXII)}$



for

$\text{Ar} = \text{C}_6\text{H}_5 \text{ (XVIII), } p\text{-ClC}_6\text{H}_4 \text{ (XXIII), } p\text{-NO}_2\text{C}_6\text{H}_4 \text{ (XXIV)}$

from the reaction with 2 moles of H_2NAr . A series of previously undescribed phosphonivinyldiaminoazomethylenes of the general formula $\text{Cl}^- \text{Ph}_3\text{PCH}=\text{CHC}(=\text{NR}_2)\text{CH}_2\text{NHR}$ were prepared. References: 4 Russian; Figures 2; Tables 2.

[62-12027]

SYNTHESIS AND STUDY OF THE PHOSPHONIUM SALTS OF CHLOROMETHYL- β -CHLOROVINYLKETONE AND TRIPHENYLPHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 54-58
manuscript received 26 Feb 80

MEGERA, I. V., LEBEDEV, L. B. and SHEVCHUK, M. I.,
Chernovitskiy State University

[Abstract] The title syntheses were carried out in ether solutions equimolar with respect to the reagents according to the reaction



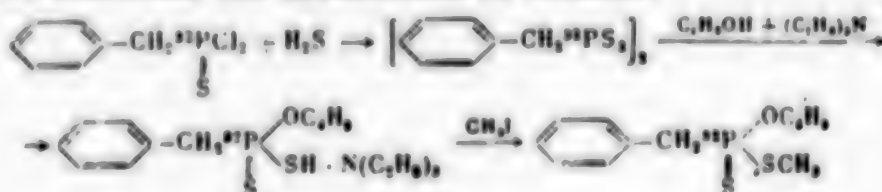
with the formation of a previously unknown β -chloroacetyltriphenylphosphoniochloride (I). The chemical characteristics of (I) are dictated by three active sites: the carbonyl group, the chloromethyl group, and the carbon-carbon double bond. Compound (I) reacts with cyclopentadiene forming bicyclo-[2,2,1]-4-chloroacetyl-S-triphenylphosphoniochloride-1-heptene, which in turn will react with 4-nitrophenylhydrazine and 2,4-dinitrophenylhydrazine resulting in the corresponding hydrazones of β -chloroacetylvinyltriphenylphosphoniochloride. Conditions were established for which β -chloroacetylvinyltriphenylphosphonium chloride would react with phenyl-, 4-nitrophenyl-, and 2,4-dinitrophenylhydrazines at both the carbonyl and the chloromethyl groups, forming the phosphoniohydrazonhydrazines of $\text{Cl-P}(\text{C}_6\text{H}_5)_3\text{-CH=CH-C(NHNHAr)=NNHAr}$. References: 2 Russian; Figures 4.
[62-12027]

SYNTHESIS OF O-BUTYL-S-METHYLBENZYL DITHIOPHOSPHONATE CONTAINING RADIOACTIVE TRACERS P-32 AND C-14

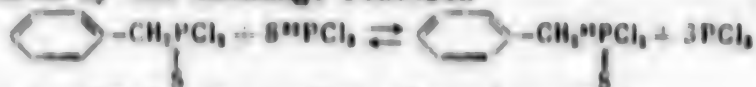
Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 59-61
manuscript received 5 May 80

KHOKHLOV, P. S., SOKOLOVA, G. D. and KLIMOV, O. V.,
All-Union Scientific Studies Institute of Phytopathology

[Abstract] The title acaricide was synthesized as follows:



The introduction of the ^{14}C label was accomplished using radioactive methyl iodide in the last step of the synthesis. The reactant benzylthiophosphoric acid with the radiolabeled P was prepared by the exchange reaction



The obtained product was purified using column chromatography.

References: 4 Russian; Figures 1.

[62-12027]

UDC 541.67:546.85

DIPOLE MOMENTS OF BONDS OF ARYL-SUBSTITUTED PHOSPHORUS AND ARSENIC

Leningrad ZHURNAL OF FIZICHESKOY KHIMII in Russian Vol 51(113), No 1, Jan 81 pp 79-86
manuscript received 5 May 80

KHALITOV, F. G. and VERESHCHAGIN, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Data on the title topic can be used to study the spatial and electronic structure of molecules. Values of the dipole moments of compounds having the general formula $\text{p-IC}_6\text{H}_4\text{ER}_2$ for $\text{E}=\text{N}, \text{P}, \text{As}, \text{Sb}, \text{Bi}, \text{PO}$, and others were taken from the literature. Valence angles were calculated for these compounds and ranged from 93.4° to 116° . A graphic method was used to calculate the dipole moment vectors. Such data obtained for the para-substituted compounds may be used for conformational studies of the "unbalanced" meta- and ortho-substituents to obtain values for syn and anti moments and the composition of the configurational equilibrium. For electronegative meta-substituents, the electrostatic repulsion of the $\text{C}_{\text{Ar}}-\text{X}$ and $\text{As}=\text{Y}$ dipoles leads to some destabilization and a more polar syn form. The bond moment of non-symmetrically substituted P and As derivatives deviate significantly from those obtained if the component moments were additive.

References 28; 19 Russian, 9 Western; Figures 2; Tables 5.

[62-12027]

PRODUCTION AND EXTRACTION OF TRIBUTYLPHOSPHINE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 pp 17-19

RATANOVA, A. I. and IMYANITOV, N. S.

[Abstract] The production of tributylphosphine by interacting butyl magnesium chloride with phosphorus trichloride is analyzed for the purpose of developing the technology of an industrial process. The conditions of the selective reaction that produces TBP are determined, an effective method of extracting it from the reaction mixture is found and the waste problem is solved. TBP is synthesized by feeding a 15-20% PCl_3 solution in solvent into 15% butyl magnesium chloride solution with vigorous mixing and cooling of the reaction mixture in an ice bath. The synthesis products are treated with water, acidified with hydrochloric acid with vigorous mixing and cooling in an ice bath. The reaction produces a complex of TBP with magnesium chloride, which settles out as a light gray cotton-like precipitate, and no TBP remains in solution. The synthesis products also contain a small quantity of TBP oxide, corresponding to the amount of phosphorus oxychloride in PCl_3 . Diphenyl amine in the amount of 0.2% by weight of tertiary phosphine is used as the oxidation inhibitor in the water treatment stage. The stoichiometric ratios of the starting components are given for the most selective TBP production process in simple ether. Diisopropyl ether, which is less volatile and fire hazardous than diethyl ether and cheaper and more abundant than dibutyl ether, was selected as solvent for the development of the technology of an industrial TBP production process. The TBP yield in this solvent is 94-96% of theoretical in terms of PCl_3 . Water is utilized to decompose the TBP-magnesium chloride complex for the purpose of treating and utilizing waste water, which contains NH_4Cl . When the reaction mixture contains unreacted butyl magnesium chloride hydrochloric acid is added to the water in the amount necessary to convert the basic magnesium chloride to MgCl_2 . Then TBP can be extracted from the organic phase by distillation in a vacuum. Enough water is added to make the aqueous layer a 25% solution of magnesium chloride. References 19: 10 Russian, 9 Western.

[61-7872]

REACTIONS OF DIALKYLAMIDODITHIOPHOSPHITE WITH DITHIOPHOSPHORIC ACIDS

Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2396-2400
manuscript received 20 May 80

BATYYEVA, E. S., OFITSEKOV, Ye. N., SINYASHIN, O. G., MUSINA, T. A. and
PUDOVNIK, A. N., Institute of Organic and Physical Chemistry imeni A.Ye. Arbuzov,
Kazan' Branch of the USSR Academy of Sciences

[Abstract] Reactions of dithioethyl and dithiopropyl esters of diethylamido-phosphorous acid with dimethyl- and diethyldithiophosphoric acids were studied using a 1:2 ratio of amide:acid. The room temperature reactions were energetic and reversible, leading to the formation of diethylammonium salts of dithio-phosphoric acid and mixed anhydrides of dithiophosphoric and dithiophosphorous acids. Their structures were supported by physical-chemical data (PMR, NMR³¹P and IR). The starting dithiophosphoric acid does not react at room temperature with the anhydride formed. Figures 2; references: 9 Russian.
[82-7813]

UDC 541.623+547.26'118+547.419.1

MONOXIDES OF UNSYMMETRIC AMIDOALKOXYDIPHOSPHINES AND THEIR ISOMERIC MIXED ANHYDRIDES. PHOSPHOROTROPIC TAUTOMERISM

Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2400-2409
manuscript received 21 Apr 80

FOSS, V. L., LUKASHEV, N. V., PETROVSKIY, P. V. and LUTSENKO, I. F.,
Moscow State University imeni M. V. Lomonosov, Institute of Metalorganic Compounds,
USSR Academy of Sciences

[Abstract] Structural studies of unsymmetric diposphine oxides containing only R₂N and RO groups could give detailed information on the role of electronic factors in determining relative thermodynamic stability of diposphine monoxides and their isomers—the anhydrides. RO(Et₂N)P(O)-P(OR)₂ (I) and RO(Et₂N)P-P(O)(OR)₂ (II) type monoxides were synthesized by the reaction of respective acid chlorides with the salts of trivalent phosphorus acids. The least thermodynamically stable isomers RO(Et₂N)-P-O-P(OR)₂ (III), which in turn can isomerize into the monoxides II. The overall thermodynamic stability was related to electronic factors; the accumulation of electron accepting groups (RO) in the molecule led to relatively increased stability of the anhydrides. While comparing two isomeric monoxides, it

was found that the more stable one had fewer RO groups at the tricoordinated phosphorus atom. An equilibrium involving all three isomers $I \rightleftharpoons II \rightleftharpoons III$ could be demonstrated only for the monoxide with a single RO group. This appears to be the first case of a reported phosphorotropic tautomerism between unsymmetric diphosphine monoxides and their isomeric mixed anhydrides. References 14: 10 Russian, 4 Western.

[82-7813]

UDC 547.26'118

PHOSPHORYLATION OF THE IMINOANALOGUES OF α -HALOCARBONYL COMPOUNDS. 2. COMMUNICATION.
REACTION OF SUBSTITUTED HALOACETIC ACID AMIDINES WITH TRIALKYLPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2409-2413
manuscript received 22 Feb 80

SINITSA, A. D., KRISHTAL', V. S., KAL'CHENKO, V. I. and MARKOVSKIY, L. N.,
Institute of Organic Chemistry, USSR Academy of Sciences

[Abstract] A continuation of the studies of the phosphorylation of imino analogues of α -halocarboxylic compounds showed that mono- and dialkyl substituted trichloroacetamidines react with equimolar quantities of trialkylphosphites (I) in refluxing benzene or acetonitrile forming N-phosphorylated products. The initial products are most probably ketenaminals $[CCl_2=C-N(R'')PO(OAlk)_2]$ which convert to energetically more stable N^2 -phosphorylated dichloroacetamidines.

Trimethyl-trichloroacetamidine reacts with I only at elevated temperatures at which considerable tarring occurs. When an N^2 -methyl group was substituted with trimethylsilyl or diethoxyphosphoryl group, the reaction with I was easier, but the products could not be isolated from the reaction mixture. Trifluoroacetamidines did not react with I. References 6: 4 Russian, 2 Western.

[82-7813]

PHOSPHORYLATION OF THE IMINO ANALOGUES OF α -HALOCARBONYL COMPOUNDS. 3 COMMUNICATION.
REACTION OF AMIDINES OF HALOACETIC ACIDS WITH TRIALKYLPHOSPHINES AND HEXAMETHYLTRI-
AMIDOPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2413-2420
manuscript received 4 Mar 80

SINITSA, A. D., KRISHTAL', V. S., KAL'CHENKO, V. I. and MARKOVSKIY, L. N.,
Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] Continuing the studies of the effects of amidine structures and of the properties of phosphorylating agents on the phosphorylation, it was shown that the reactivity of amidines depends on the number and position of the substituents at the nitrogen atom, and on the number and type of halogens in the methyl halide radical. Trimethyltrichloroacetamidine does not react with triarylphosphines (I). N^1, N^2 -Dimethyltrichloroacetamidine reacts with I upon heating in benzene, and the N -alkyl- and N, N -dialkyltrichloroacetamidine react exothermally with I. In general, a decreased number of alkyl groups at the nitrogen atom, the introduction of an acceptor group, and a higher degree of chlorination at the methyl group of acetamidines increase their electrophilic properties and reactivity towards I. The phosphorylation of dichloro- and trichloroacetic acid amidines with I is a satisfactory way for synthesizing phosphonium derivatives of chloro- and dichloroacetamidines. References 12: 8 Russian, 4 Western.
[82-7813]

UDC 547.56+535.34:542.91

STEREODYNAMIC CHARACTERISTIC OF N^1 -DIETHOXYPHOSPHORYL- AND N^1 -TRIPHENYLPHOSPHONIUM-
 N^1, N^2 -DIMETHYLAMIDINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2420-2425
manuscript received 22 Apr 80

NEGREBETSKIY, V. V., BOGEL'FER, L. Ya., KAL'CHENKO, V. I., KRISHTAL', V. S.,
SINITSA, A. D. and MARKOVSKIY, L. N., All Union Scientific Research Institute of
Chemical Plant Protective Agents Institute of Organic Chemistry,
UkSSR Academy of Sciences

[Abstract] Dynamic processes occurring in N^1, N^2 -dimethyl- N^1 -diethoxyphosphoryl-dichloroacetamidine (I) and N^1, N^2 -dimethyl- N^1 -triphenylphosphoniumdichloroacetate-(benz)amidine (II) salts were studied using NMR 1H , ^{13}C , ^{31}P spectroscopy. Dichloroacetamidines exhibit prototropic migrations in the potentially ambident

triade $\text{CCl}_2\text{---}\ddot{\text{C}}\text{---}\ddot{\text{N}}$, and this phenomenon could possibly be responsible for the stereochemical behavior of these molecules. At room temperature, I shows two NMR signals which convert to one at 95°C and remain there even at 150°C. Such a behavior is due to the process of syn-anti isomerism. The II type compounds do not manifest syn-anti isomerism. At room temperatures their methyl groups show a doublet [$-\text{N}(\text{CH}_3)_2$] and a singlet ($=\text{CH}_3$); with temperature increase these signals merge into a doublet with an intermediate chemical shift. The CHCl_2 doublet position and shape are independent of temperature. This may be explained by a rapid, reversible intramolecular migration of the triphenylphosphonium group in the system N-C-N . This phosphorotropic tautomerism of the amidine system is affected by substituents at the carbon and nitrogen atoms. Figure 1; references 14: 8 Russian, 6 Western.
[82-7813]

UDC 546.18

ALKYLATION PRODUCTS OF THE REACTION OF PHOSPHORUS DIIODIDE WITH ALKYL IODIDES AND THEIR STRUCTURES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2436-2442
manuscript received 30 Apr 80

MAKOVETSKIY, Yu. P., FESHCHENKO, N. G., MALOVIK, V. V., SEMENIY, V. Ya.,
BOLDESKUL, I. Ye., BONDAR', V. A. and CHERNUKHNO, N. P.,
Institute of Organic Chemistry, USSR Academy of Sciences

[Abstract] Novel reaction products were isolated from the reaction of red phosphorus with methyl, ethyl, propyl and cetyl iodides. Analogous products could be obtained by heating trialkylphosphines with iodine at 200°C, or by refluxing these reagents in acetonitrile. On the basis of the analysis of long wavelength IR spectra, the reaction products should have had the following structure: $(\text{Alk}_3\text{P}^+-\text{P}^+\text{Alk}_3)2\text{I}_3^-$. The spectra of phosphonium salts containing a complex anion I_5^- or I_7^- invariably show patterns of much simpler structures containing an I_3^- anion. This led the authors to the conclusion that in the crystalline state, these polyiodide anions consist of an I_3^- anion with weakly interacting I_2 molecules. References 16: 9 Russian, 7 Western.
[82-7813]

PHOSPHORYLATED ADAMANTANES. 1 COMMUNICATION. PHOSPHORYLATION OF 1- AND 2-HYDROXYADAMANTANE WITH TRIVALENT PHOSPHORUS ACID CHLORIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2443-2447
manuscript received 10 Dec 79

YURCHENKO, R. I., KLEPA, T. I., MISHAK, M. I. and TIKHONOV, V. P.
Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev Polytechnical
Institute

[Abstract] Phosphorus trichloride reacts with 1- and 2-hydroxyadamantanes (I) in the presence of triethylamine to yield adamantyldichlorophosphites (II) and triadamantylphosphites (III). No diadamantylchlorophosphites could be obtained. Reactions of III with sulfur or p-nitrophenylazide yielded respectively triadamantylthiophosphates and -phosphazo compounds. Ethyldichlorophosphite, phenyldichlorophosphonite and diethylchlorophosphite react with I to form acid chlorides, AdOP(OR)Cl , or mixed phosphites, AdOP(OR)_2 . Methanol reacting with II yields the phosphites $\text{AdOP(OCH}_3)_2$. Finally, with PCl_3 I gives diadamantyl esters of phosphorous acid, $(\text{AdO})_2\text{P(O)H}$. References 8: 2 Russian, 6 Western.
[82-7813]

UDC 547.341

REACTIVITY OF SULFURYL CHLORIDE IN REACTIONS WITH 1,2-ALKADIENEPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2448-2452
manuscript received 4 Jun 80

ANGELOV, Kh. M., Higher Pedagogical Institute, Shumen, People's Republic of Bulgaria

[Abstract] The addition of sulfonyl chloride to 1,2-propadienephosphonates mono and disubstituted in position 3 chlorinates the $\text{C}^2\text{-C}^3$ double bond, followed by cyclization to 1,2-oxaphosphol-3-enes. Reaction of sulfonyl chloride with the ethyl ester or dichloride of 1,2-propadiene phosphonic acid requires higher temperature ($60\text{-}70^\circ\text{C}$), and leads to the formation of a complex mixture of chlorinated products similar to that obtained from chlorination of phosphonates. References: 7 Russian.
[82-7813]

PHOSPHORUS CONTAINING CROWNS. 2. COMMUNICATION. DIBENZOMETHYLPHOSPHONYL-20-CROWN-7

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2452-2454
manuscript received 30 Apr 80

KIRSANOV, A. V., KUDRYA, T. N. and SHTEPANEK, A. S.,
Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] The goal of this study was to synthesize crown compounds with strong complexing properties. This was achieved by refluxing β, β' -dichlorodiethyl ester of methylphosphonic acid with sodium 2,2-(hydroxydiethylenedioxy)diphenoxide in DMFA under anhydrous conditions. The product, dibenzomethylphosphonyl-20-crown-7 was obtained with a m.p. 143-144, after crystallization from acetone or methylethyl ketone. It is soluble in DNFA and CHCl_3 . References 5: 4 Russian, 1 Western.
[32-7813]

REACTIONS OF PHOSPHORUS CONTAINING TRI- AND TETRASULFIDES. REACTION OF BIS(DIALKOXYPHOSPHORYL- AND -THIOPHOSPHORYL)TRI- AND -TETRASULFIDES WITH PRIMARY AMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2455-2458
manuscript received 14 Jan 80

KHASHKIN, B. A., TOLMACHEVA, N. A. and PROMONENKOV, V. K.,
All Union Scientific Research Institute of Chemical Plant Protective Agents

[Abstract] In the reaction of bis(dialkoxyphosphoryl- and -thiophosphoryl)tri- and -tetrasulfides with primary amines, the disulfide bond next to the phosphorus atom is broken. This leads to the formation of novel dialkoxyphosphoryl- and -thiophosphoryl-N-monoalkylaminodi- and -trisulfides and salts of O,O-dialkylthio- or -dithiophosphoric acids. The reaction is carried out in a nonpolar organic solvent at 0-5°C or at room temperature and is exothermic. References 8: 5 Russian, 3 Western.
[82-7813]

CATALYTIC REACTION OF ARYLDIAZONIUM BOROFUORIDES AND SULFATES WITH DIVINYL AND ISOPRENE IN THE PRESENCE OF POTASSIUM O,O-DIALKYL(ARYL)DITHIOPHOSPHATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2459-2462
manuscript received 26 Mar 80

GANUSHCHAK, N. I., VENGRZHANOVSKIY, V. A., BARANOV, V. A. and BACHINSKIY, T. P.
Khmel'nitskiy Technological Institute of Social Services,
L'vov State University imeni I. Franko

[Abstract] Aryldiazonium sulfates and borofluorides react energetically with diene compounds at -15 to -5°C and in the presence of copper carbonates to yield 1-[O,O-dialkyl(aryl)-S-dithiophosphate]-4-aryl-2-butenes. The addition to the double bond system was exclusively 1-4. The structure of these compounds was verified by independent synthesis and by alkaline breakdown to corresponding mercaptans and potassium O,O-dialkyl(aryl)thiophosphonates. References 8: 6 Russian, 2 Western. [82-7813]

UDC 547.26'118

ADDITION OF CYCLOPHOSPHOROUS ACIDS TO UNSATURATED COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2615-2616
manuscript received 12 May 80

OVCHINNIKOV, V. V., CHEREZOV, S. V., GALKIN, V. I., CHERKASOV, R. A. and
PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] It was shown that, in contrast to acyclic analogues, cyclophosphorous acids exhibit high reactivity in the addition reactions to nucleophilic double bonds. The reaction of pyrocatecholphosphorous acid, 2,3-butylenephosphorous acid and 2,3-butylenethiophosphorous acid with styrene, anethole and vinyl butyl ester occurred easily upon heating to 60-100°C in an atmosphere of argon. The products,

$\text{R} \begin{array}{c} \diagup \text{O} \diagdown \\ \diagdown \text{O} \diagup \end{array} \text{P} \begin{array}{c} \diagup \text{X} \diagdown \\ \diagdown \text{CH} \diagup \end{array} \text{CH}_2 \text{Y}$ rearrange to the phosphonates $\text{R} \begin{array}{c} \diagup \text{O} \diagdown \\ \diagdown \text{O} \diagup \end{array} \text{P} \begin{array}{c} \diagup \text{X} \diagdown \\ \diagdown \text{CH} \diagup \end{array} \text{CH}_2 \text{Y}$. References: 2 Russian.

[82-7813]

EXCHANGE REACTION OF SUBSTITUENTS AT P^{III} ATOM WITH THE PARTICIPATION OF
ACETOXY AND AMIDE GROUPS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2616-2617
manuscript received 24 May 80

AL'FONSOV, V. A., ZAMALETDINOVA, G. U., BATYYEVA, E. B. and FUDOVIK, A. N.
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
USSR Academy of Sciences

[Abstract] Diethylamide of ethylphenylphosphinous acid reacts with diethylacetylphosphite forming diethylamidodiethylphosphite and acetylethylphenylphosphinite. The reaction is reversible with all components remaining in equilibrium. Further heating of this mixture to 90°C for 8 hrs yields 1-ethyl-1-phenyl-2-oxo-2,2-diethoxydiphosphine. This occurs evidently as a result of Arbuzov's rearrangement. In an analogous manner, hexamethylamidophosphite and diethylacetylphosphite yield tetramethyldiamidoacetylphosphite and dimethylamidodiethylphosphite. References 2: 1 Russian, 1 Western.

[82-7813]

ADDITION OF SULFURYL CHLORIDE TO THE P=O BOND

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 p 2618
manuscript received 12 May 80

MALOVIK, V. V., BONDAR', V. A., CHERNUKHO, N. P. and SOLODUSHCHENKO, G. P.,
Institute of Organic Chemistry, USSR Academy of Sciences

[Abstract] Tertiary phosphine oxides and phosphoric acid triamides add sulfonyl chloride along the P=O bond. This forms phosphonium salts $R_3P^+OSO_2Cl Cl^-$, colorless crystalline compounds soluble in CH_2Cl_2 , dichloroethane and $CHCl_3$; they were insoluble in ether, hexane, benzene and CCl_4 . The following compounds have been reported (R, m.p. being reported): Et, 110-119°C; Bu, 36-42°C; and Me_2N , 176°C with decomposition. References: 1 Western.

[82-7813]

REACTION OF ADAMANTANONE WITH PHOSPHORUS TRICHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 p 2619
manuscript received 13 May 80

GAMALEYA, V. F., BOROCHINSKIY, A. Ye., ALEKSANDROV, A. M., PAVLENKO, A. F. and KUKHAR', V. P., Institute of Organic Chemistry, USSR Academy of Sciences

[Abstract] Adamantanone reacts with PCl_3 under Conant reaction conditions to yield 2-hydroxyadamantyl-2-phosphonic acid (I) m.p. 215-217°C. Using HI this acid can be easily converted to 2-adamantylphosphonic acid (II) m.p. 276-278°C. Both acids can be converted to diesters using diazomethane: dimethyl ester of I m.p. 133-134°C, dimethyl ester of II m.p. 48-50°C. References 3: 1 Russian, 2 Western. [82-7813]

UDC 547.241

SYNTHESIS OF β -BROMOALKYLPHOSPHONIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 p 2620
manuscript received 12 May 80

FEDOROVA, G. K., ANAN'YEVA, L. G. and FESHCHENKO, N. G.

[Abstract] A synthetic method was developed for β -bromoalkylphosphonic acids. A mixture of 0.06 mole β -chloroalkylphosphonic acid and 40-50 ml 44% hydrobromic acid was refluxed for 6 hrs. Any excess acid was distilled off, the residue was dissolved in 30 ml benzene or ethyl ether, and the product, β -bromoalkylphosphonic acid, was recrystallized from petroleum ether. The following β -bromoalkylphosphonic acids were synthesized (R, m.p. being reported): methyl, 158-159°C; hexyl, 130-131°C; and heptyl, 112-113°C. References: 2 Russian. [82-7813]

N, N-BIS(TRIMETHYLSILYL)AMIDE OF N'-(1-ADAMANTYL)-IMIDOPHOSPHENOUS ACID

Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2621-2622
manuscript received 27 May 80

MARKOVSKIY, L. N., ROMANENKO, V. D., DZYUBA, V. I., LIPPMAA, E. T. and ALLA, M. A.,
Institute of Organic Chemistry, USSR Academy of Sciences, Institute of Chemical
and Biological Physics, ESSR Academy of Sciences

[Abstract] An acyclic dicoordinated phosphorus compound with a $3p_{\pi}(P)-2p_{\pi}(N)$ bond was synthesized. The product, N,N'-bis-(trimethylsilyl)amide of N'-(1-adamantyl)imidophosphinous acid was a colorless crystalline material, b.p. $118-120^{\circ}\text{C}/0.02 \text{ mm Hg}$, m.p. $80-82^{\circ}\text{C}$, stable up to 200°C . Its structure was deduced from analytical and spectral data (high resolution NMR ^{31}P). In the solid state it was shown to be a monomer. References: 2 Western.
[82-7813]

OXIDATIVE PHOSPHORYLATION OF PROPARGYL HALIDES

Leningrad ZHURNAL OSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2622-2623
manuscript received 5 Jun 80

YEFANOV, V. A., DOGADINA, A. V., IONIN, B. I. and PETROV, A. A.,
Leningrad Technological Institute imeni Lensovet

[Abstract] The reaction of PCl_3 and O_2 with propargyl type alkyne halides occurs through the addition of chlorine and dichlorophosphonate groups to the triple bond yielding $\text{R}'\text{CCl}=\underset{\text{CR}^2\text{R}^3}{\text{C}}-\text{P}(\text{O})\text{Cl}_2$. When treated with triethylamine, these products underwent dehydrochlorination yielding 1,3-butadienes with a dichlorophosphonic group in position 2. These compounds are key starting materials for the synthesis of phosphonoprebes. References 4: 2 Russian, 2 Western.
[82-7813]

REACTION OF BIS(DIALKOXYPHOSPHORYL)DISULFIDES WITH DIAZOMETHANE. A NOVEL
REARRANGEMENT IN A SERIES OF PHOSPHORUS CONTAINING DERIVATIVES OF DISULFIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 50, No 11, Nov 80 pp 2629-2630
manuscript received 28 Apr 80

KHASKIN, B. A., SHELUCHENKO, O. D., TORGASHEVA, N. A., NEGRENETSKIY, V. V.,
KOROLEVA, T. I. and PROMENENKOV, V. K.,
All Union Scientific Research Institute of Chemical Plant Protective Agents

[Abstract] Bis(dialkoxyphosphoryl)disulfides react in light or dark with
diazomethane to yield dialkoxythiophosphoryloxy-dialkoxyphosphoryl thiomethanes.
The reaction, carried out at -10 to -5°C is over in a few minutes. The following
compounds have been prepared: dipropoxythiophosphoryloxy-dipropoxyphosphorylthio-
methane, d_4^{20} 1.1456, n_D^{20} 1.4756; its diisopropoxy analogue, d_4^{20} 1.1435,
 n_D^{20} 1.4696 and the dibutoxy analogue, d_4^{20} 1.1002, n_D^{20} 1.4749.

References: 1 Russian.

[82-7813]

UDC 542.91:547.1'118

SYNTHESIS OF DIALCOXY- AND DIPHENOXYPHOSPHORYLALKYLENEDITHIOPHOSPHYTES BY THE
MICHAELIS-BECKER REACTION

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 12,
Dec 80 pp 2788-2790 manuscript received 6 Mar 80

ERMANSON, L. V., BLAGOVESHCHENSKIY, V. S. and GODOV'NIKOV, N. N.,
Institute of Elementary Organic Compounds, USSR Academy of Sciences, Moscow and
Moscow State University imeni M. V. Lomonosov

[Abstract] The behavior of trialkylphosphytes with alkylenedithiophosphytes and
mixed thioanhydrides of dithiophosphoric acids was determined in Michaelis-
Becker reaction. All the reactions were carried out in anhydrous solvents in a
dry inert gas atmosphere. Diphoxyphosphorylalkylenedithiophosphyte and
diphenoxyphosphorylalkylenedithiophosphyte with P(III)-P(V) bond are formed from
the acid compounds. References: 2 Russian.

[83-6521]

REARRANGEMENT IN ACYLATION OF PHOSPHORUS KETOILIDES BY TRIFLUOROACETIC ANHYDRIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 12,
Dec 80 pp 2805-2808 manuscript received 8 Apr 80

NESMEYANOV, N. A., BERMAN, S. T., PETNOVSKIY, P. V. and REUTOV, O. A.,
Institute of Elementary Organic Compounds imeni A. N. Nesmeyanov,
USSR Academy of Sciences, Moscow

[Abstract] Acylation of ketoilides was carried out to determine regrouping with migration of methane and PhCH_2 to carbon. The reaction mechanism is similar to alkylation of ambident β -oxyalkyladientriphenolphosphoranes. The ilide forms a complex with $\text{CF}_3\text{CO}_2\text{H}$ that is identical to the ilide itself by nuclear magnetic resonance spectrum, but differs sharply by infrared spectrum. The $\text{CF}_3\text{CO}_2\text{H}$ forms strong hydrogen bonds with the trifluoroacetate anion. The ilides, acetylmethylene triphenolphosphorane and benzoil methylene triphenolphosphorane are acylated by trifluoroacetic anhydride by the oxygen of the carbonyl group. Slow rearrangement with migration of the acyl to carbon occurs upon heating. Figures 1; references 5: 4 Russian, 1 Western.
[83-6521]

KINETICS OF ALKALINE HYDROLYSIS OF AMINOALKYLPHOSPHONIC ACID ESTERS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 12, Dec 80
pp 2811-2814 manuscript received 22 Apr 80

BEL'SKIY, V. Ye., KUDRYAVTSEVA, L. A., KURGUZOVA, A. M. and IVANOV, B. Ye.,
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,
Kazan' Branch of USSR Academy of Sciences

[Abstract] The rate constants of alkaline hydrolysis of some diethylaminoalkylphosphonic acid esters and other alkyl-substituted diethylalkylphosphonates were determined. The reactivity of the aminoalkylphosphonic acid esters and other substituted diethylalkylphosphonates was compared. The effect of the number of α -CH bonds in alkyl radicals in phosphorus on the reactivity of phosphonic acid esters was shown during alkaline hydrolysis. Figures 1; references 11: 8 Russian, 3 Western.
[83-6521]

HALOGENATION OF π -CYCLOPENTADIENYLTRICARBONYL RHENIUM AND π -CYCLOPENTADIENYL (TRIPHENYLPHOSPHINE) DICARBONYL RHENIUM

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 2, Feb 81 pp 408-413 manuscript received 4 Mar 80

KOLOBOVA, N. Ye., VALUYEVA, Z. P. and KAZIMIRCHU, Ye. I.,
Institute of Elementary Organic Compounds imeni A. N. Nesmeyanov,
USSR Academy of Sciences, Moscow

[Abstract] Previously unknown semi-coordinated rhenium compounds were synthesized by oxidation of π -cyclopentadienyltricarbonyl rhenium and π -C₅H₅Re(CO)₂PPh₃ dichlorine, thionyl chloride and iodine. Two of the rhenium compounds were separated into cis-isomers and trans-isomers. Figures 1; references 12: 6 Russian, 6 Western.

[90-6521]

SUBSTITUTION OF THE CYANO GROUP IN PHOSPHORUS CYANIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 2, Feb 81 pp 454-455 manuscript received 22 Jul 80

PUDOVIK, A. N., ROMANOV, G. V. and VOLKOVA, V. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] The interaction of phosphorus cyanides with protone-containing reagents with phosphines and amines was studied. The reaction of diphenylcyanophosphine with diphenylphosphine and the reaction of diethylcyanophosphite with diethylamine, sodium diethylphosphite and ethyl alcohol was studied. Interaction of dialkylcyanophosphates with alcohol yields trialkylphosphates. References 5: 2 Russian, 3 Western.

[90-6521]

REACTION OF DIETHYLCYANOPHOSPHITE AND ACETYLACETONE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 2, Feb 81
pp 453-454 manuscript received 22 Jul 80

PUDOVIK, A. N., ROMANOV, G. V. and VOLKOVA, V. N., Institute of Organic and
Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] The interaction of diethylcyanophosphite and acetylacetone was studied with respect to formation of diethyl- α -methyl- β -acetovinylphosphite upon removal of the separated HCN. Diethylcyanophosphite reacts with the enol form of acetylacetone by the nucleophilic substitution reaction. The reaction byproduct is a mixture of Z- and E-isomers. The paramagnetic and nuclear magnetic resonance spectra of the vinyl fragment of the E- and Z-isomers were taken on a spectrograph. References 6: 5 Russian, 1 Western.

[90-6521]

PETROLEUM PROCESSING TECHNOLOGY

UDC 665.666.002.8.665:620.193.665.64.013

VISBREAKING OF TAR FROM A MIXTURE OF WEST-SIBERIAN OIL ON A THERMAL CRACKING UNIT

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 80 pp 49-50

GERASICHEVA, Z. V., SOSKIND, D. M., GLUKHOV, Yu. I. and DEKHTERMAN, A. Sh.,
All-Union Scientific Research Institute for Oil Refining

[Abstract] A common, unmodified thermal cracking unit was tested for the production of fuel oil from tar. The tar yield from the West-Siberian oil was 23-25%. Temperature and pressure within the unit were regulated. In comparison with thermal cracking, visbreaking of tar produces less gas and gasoline and more fuel oil. Cracking residues had a higher density, viscosity and pour point, and a lower content of fractions up to 500°C. The fuel oil met all requirements for brand 100 fuel oil. Table 1.

[43-9307]

UDC 621.892.28.001.5

OILS WITH A DIESTER BASE

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 80 pp 31-33

VILENKIN, A. V., NOVOSARTOV, G. T., KRYLOVA, G. I. and YECHIN, A. I.

[Abstract] Requirements for oil quality increased as aircraft engine designs improved. The quality of synthetic oils with a diester base is the subject of the U.S. specifications MIL-L-7808 (C, D, E, G and H). The requirements have included increased thermooxidative stability, compatibility of oil with synthetic resins and the physicochemical parameters of the resins, limitation of oil metal content, and testing of oils on full-scale models. Similar standards have been put into effect in France (AIR.3514, 1971) and Belgium (BA-PO-116, 1972). The physical characteristics of several non-Soviet oils (Esso Turbo Oil 2389, Avrex S Turbo 256, BP Aero Turbine Oil 15, Castrol 325 and American PQ Lubricant 6899) and the Soviet Oil VNII NP50-1-4f, which also has a dicarboxylate base, are compared. All oils

were very similar. Differences were found in viscosity, properties of antisludge agents, acid number, hygroscopicity and hydrolytic stability. The non-Soviet oils had a greater tendency for moisture absorption. Hydrolytic stability depended on additives and was highest in Esso Turbo Oil 2389, Avrex S Turbo 256 and Castrol 325. Tables 2; references 3: 1 Czech, 2 Western.

[43-9307]

UDC 621.892.2(088.8)

ORGANOXYCYCLOTRIPHOSPHAZENES AS LUBRICATING OIL ADDITIVES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 80 pp 24-25

LETIN, A. S., USS, I. I., ZAPUSKALOVA, S. F., FEDOROV, S. G. and GOL'DIN, G. S.

[Abstract] (Fluoralkoxy)chloro- and fluoralkoxy(alkoxy)cyclotriphosphazenes were tested as additives to organosilicon fluids, e.g., oligomethylsiloxane with a gamma-trifluoropropyl radical (FS-T-5) and dioctyl sebacinate. The synthesized cyclotriphosphazenes were clear colorless or lightly colored fluids with a viscosity of 70-120 mm²/s. Tests were run on a four-ball fatigue tester with 3-mm steel-ruby friction pairs. Organoxycyclotriphosphazenes with mixed substituents were more effective additives than hexa(butoxy)- or hexa(fluoralkoxy)cyclotriphosphazenes. The optimal additives were organoxycyclotriphosphazenes with an equal number of butoxy- and tetrafluoropropoxy groups. Tables 3; figures 2; references 6:

4 Russian, 2 Western.

[43-9307]

UDC 665.644.26:51.001.57

ESTIMATION OF PRODUCTS FROM THE HYDROCRACKING OF NORMAL ALKANE HYDROCARBONS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 9, Sep 80 pp 5-7

KHAVKIN, V. A., ZHOROV, Yu. M., PANCHENKOV, G. M., TATARINTSEVA, G. M., KOZLOV, I. T. and AGAFONOV, A. V.,

All-Union Scientific Research Institute for Oil Refining

[Abstract] A mathematical description is provided of the hydrocracking of normal alkanes, which is based on a kinetic model for raw material conversion and the law for normal distribution, for estimating the amount of products differing in a molecular weight. The mathematical description was supported by experimental data

for alkanes with six to ten carbon atoms. Within a limited region of variations in hydrocracking conditions, distribution of products according to molecular weight depends on the type of raw material. Hydrocracking proceeds with the preferential breaking of the carbon-carbon bonds near the center of the molecule. Activation energy for normal alkane hydrocracking does not depend on molecular weight.

Tables 3; figures 4; references: 3 Russian.

[43-9307]

UDC 665.61:66.094.35-54.02

BREAKDOWN OF THE RESINOUS COMPONENTS OF PETROLEUM OF VARIOUS CHEMICAL TYPES DURING OZONOLYSIS

Moscow NEFTEKHIMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 918-926

manuscript received 5 Oct 79

LEBEDEV, A. K., GORBUNOVA, L. V. and KAM'YANOV, V. F.,
Institute of Petroleum Chemistry, Siberian Branch of USSR Academy of Sciences

[Abstract] Ozonolytic splitting of neutral resins separated from petroleum of Kichik-Bel', Sovetskiy and Russkiy fields were used to investigate the most representative groups of high-molecular components of petroleum. Ozonation products from high-molecular petroleum compounds soluble in nonpolar hydrocarbon solvents were found and the reaction products were separated by solubility in the solvents and in an aqueous medium at different pH values. The chemical type of the petroleum is used to determine the yield, composition and properties of ozonation products. Breakdown is intensified, total yield is reduced and the size of the molecules of the transformation products is reduced if the concentration of polycycloaromatic structures is increased. The yield of products insoluble in alkalis increases and the degree of breakdown decreases as the sulfide components increase. Figures 1; references 10: 6 Russian, 4 Western.

[52-6521]

COMPOSITION OF SATURATED HYDROCARBONS OF FRACTIONS 150-175°C

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 1 Feb 80)
pp 20-27

SOKOLOVA, I. M., BERMAN, S. S., GERVITS, E. S., MATVEYEVA, I. A. and PETROV, A. A.,
Institute of Geology and Processing of Mineral Fuels

[Abstract] The composition of saturated hydrocarbons of fractions 150-175°C of petroleum from the Anastas'yevsko-Troitskoye, Koturdepe and Norio petroleum deposits was analyzed by capillary gas-liquid chromatography and chromatographic mass-spectrometric methods. The study identified 87 hydrocarbons of different series in these fractions, with those of C₁₀ composition predominating. About 60 percent of the petroleum fractions were cyclohexane hydrocarbons with more than one-half of these being propyl derivatives and isopropyl derivatives. It was assumed that the petroleum hydrocarbons of the fractions studied had changed little in the course of chemical evolution of these petroleum. References: 3; figures 3.
[84-2791]

UDC 547.214:546.719

CONVERSION OF HYDROCARBONS WITH STEAM IN THE PRESENCE OF ALUMORHENIUM CATALYSTS

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 3 Apr 80)
pp 33-37

RYASHENTSEVA, M. A., ROZHDESTVENSKIY, V. P., POLYANSKIY, A. B. and MOLINA, S. Ye.,
USSR Academy of Sciences Institute of Organic Chemistry imeni N. D. Zelinskiy

[Abstract] The dependence of the activity of alumorhenium catalysts on the rhenium level in them and on the nature of the initial compounds of rhenium Re⁷⁺ used in them was studied in a circulation flow type device at atmospheric pressure at 500°, 600° and 700°C, steam to isobutane ratio 12.0:1 and rate of isobutane feed 1500 hr⁻¹. The activity of alumorhenium catalysts increased with the increase of rhenium level from 1-5 percent but additional increase up to 10 percent produced no significant increase in activity especially at 700°. The nature of the initial compounds used affected the relative level of products of the reaction with the greatest activity resulting from the use of catalysts based on rhenic acid. References: 14;
Figures 2.
[84-2791]

n-OCTANE AROMATIZATION ON A POLYMETAL CATALYST

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 24 Oct 79)
pp 42-45

BEREZIN, V. A., RABINOVICH, G. B., ZABOTIN, L. I. and LEVINTER, M. Ye.,
Kuybyshev Polytechnical Institute imeni V. V. Kuybyshev

[Abstract] Development of a mathematical model of reforming n-octane in the form of 2d order equations of regression was performed and discussed. The model was used to optimize the n-octane aromatization process. It was found that selectivity of aromatization of alkanes was increased at high temperatures and short time of contact of them with the catalyst. References: 4; figures 2.
[84-2791]

UDC 547.313.5:542.952.1

SKELETAL ISOMERIZATION OF PENTENE-1 ON APPLIED NICKEL SULFATE

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 22 Feb 80)
pp 52-58

ISAGULYANI, G. V., GITIS, K. M., MAKATUN, V. N., ROZENGART, M. I., KORNYSHEV, V. N.
NIKIFOROVA, I. N. and SOLOVEY, O. M., USSR Academy of Sciences Institute of
Organic Chemistry imeni N. D. Zelinskiy

[Abstract] A study of the effect of the nature of the sulfate and the carrier on the catalytic properties of applied sulfates and the comparison of their isomerizing activity with the acidic properties was performed using 200 mg weighed samples of the catalyst at 150°, 200° and 300°C. Reaction products were analyzed on a macro-capillary column. Acidity of the catalysts was determined by butylamine titration with Hammett indicators. Ni and Al sulfates were found to be catalysts of skeletal isomerization of pentene-1 providing isopentene yields of 12-27 percent at low temperatures (150°). Products of cracking, bodying and n-C₅H₁₂ and iso-C₅H₁₂ were also obtained. The use of different sulfates, carriers and different temperatures of calcining the catalyst makes it possible to change the acidity, within wide limits and thus regulate their activity in skeletal isomerization of olefins. References: 6; figures 3.
[84-2791]

PRODUCTION OF PHENYLCYCLOHEXANE OF BENZENE HYDRODIMERIZATION ON NICKEL-CONTAINING ZEOLITE CATALYSTS

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 15 Apr 80)
pp 67-73

MARCHENKO, L. S., LEVIN, D. Z., PLAKHOTNIK, V. A. and MORTIKOV, Ye. S.,
USSR Academy of Sciences Institute of Organic Chemistry

[Abstract] The reaction of benzene hydrodimerization on nickel-containing zeolites produced by ion exchange, the role of Ni in dependence upon its state in the zeolite structure, optimum methods of catalysts selection and the reaction mechanism were examined. Catalysts containing cations Ni^{2+} , Ca^{2+} and rare earth of elements 3^+ provided end product yields of 90 percent of the theoretical value. The activity and selectivity of the catalysts studied depended upon the state of the nickel introduced as well as upon the acid characteristics of the catalysts. The intermediate formation of cyclohexene as the result of benzene hydration was found to be the initial stage of the process, proceeding with participation of finely dispersed nickel in large cavities of the zeolite structure.

References: 15; figures 5.

[84-2791]

OXIDATIVE METHYLATION OF TOLUENE BY ALKANES $\text{C}_1\text{-C}_4$

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 8 May 79)
pp 83-91

KHCHEYAN, Kh. Ye. REVENKO, O. M., BORISOGLEBSKAYA, A. V. and FRADKOV, Yu. Z.,
All-Union Scientific Research Institute of Organic Synthesis

[Abstract] The role of methane in the process and the effect of the homologs $\text{C}_2\text{-C}_4$ on the flow of the reaction was studied in a flow type device in quartz and titanium reactors by a method proposed by Kh. Ye. Khcheyan was described and discussed. Introduction of $\text{C}_2\text{-C}_4$ alkanes in concentrations of 8-10 percent by volume accelerated the process while higher concentrations inhibited it. Introduction of propylene (3-5 percent by volume) inhibited the process but a limit of inhibition was reached at higher concentrations. Studies of natural gas of the Orenburg deposit showed the possibility of use of natural gases as a methylating component of the process. References 7; figures 3.

[84-2791]

FORMATION OF UNSATURATED COMPOUNDS IN CYCLOHEXANE OXIDATION WITH OXYGEN IN THE AIR

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 24 Oct 79)
pp 98-102

KOVALENKO, N. A., LEVINA, O. V. and LIPES, V. V., State Scientific Research and Design Institute of the Nitrogen Industry and Products of Organic Synthesis

[Abstract] The first observation and identification of cyclohexene-2-on (enon) in products of cyclohexane oxidation, including industrial oxidates and products of non-catalytic high temperature oxidation were discussed. Gas chromatographic, ultra-violet spectral and infra-red methods of identification of enon were discussed. A possible mechanism of formation of cyclohexene-2-on as a result of disproportionation of radicals was proposed. References 10; figure 1.
[84-2791]

UDC 547.535.3:542.943.7

LIQUID-PHASE CATALYTIC OXIDATION OF TRIMETHYLBENZENES

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 4 Mar 80)
pp 103-109

LOPAYEVA, N. L., BOROVKOVA, G. G., PEREL'MAN, Ye. B. and KHARLAMPOVICH, G. D., Ural Polytechnical Institute imeni S. M. Kirov

[Abstract] Regularities of liquid-phase oxidation of trimethylbenzene by air without a solvent up to dimethylbenzoic acids were studied. With Mn and Co salts as catalysts $(1.9 \pm 2.5) \cdot 10^{-4}$ mole per mole of raw material at $140 \pm 145^\circ$, a 60-63 percent conversion of the raw material with selectivity of 48-75 percent was achieved. The effect of inhibitors, initiators and products of the reaction could not be considered without consideration of their interaction with the catalyst. According to selection of formation of dimethylbenzoic acids of trimethylbenzene are situated in the sequence 1,2,4-trimethylbenzene > 1,3,5 > trimethylbenzenes > 1,2,3-trimethylbenzenes. References 7; figures 4.
[84-2791]

CO-OXIDATION OF COUMENE AND ESTERS

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 3 Jan 80)
pp 110-113

OPEYDA, I. A., TIMOKHIN, V. I., NOSYREVA, O. V., KALOYEROVA, V. G. and
MATVIYENKO, A. G., USSR Academy of Sciences Institute of Physico-Organic Chemistry
and Coal Chemistry

[Abstract] A study of the effect of chlorobenzene, acetic acid and tert butanol on co-oxidation of coumene with n-butylbenzoate, benzylacetate and benzylbutyrate in a liquid phase during low temperature oxidation revealed the kinetic parameters r_1 and r_2 (reaction capacity of molecules in relation to the peroxide radical) and critical temperatures of the reaction. The rate constants of continuation of the interaction chains of the coumene peroxide radical with molecules of the esters was calculated. A study of a coumene-n-butylbenzoate system in tert butanol showed that alcohol affects the rate of oxidation of the ether in the mixture and the ratio of oxidation rates of components of the system more than it affects the rate of combined oxidation. The study suggested the possibility of regulating the direction of co-oxidation by selection of appropriate solvents. References 12; figure 1.
[84-2791]

UDC 541.459+541.128

DECOMPOSITION OF TETRALINE HYDROPEROXIDE IN THE PRESENCE OF COMPLEXES OF POLYOXYETHYLENE COMPLEXES WITH CoCl_2

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 12 Mar 80)
pp 114-117

SELEZNEV, V. A., ARTEMOV, A. V., VAYNSHTEYN, E. F. and TYULENIN, Yu. P.,
All-Union Correspondence Polytechnical Institute, USSR Academy of Sciences
Institute of Chemical Physics

[Abstract] A study of the decomposition of tetraline hydroperoxide in the presence of complexes of CoCl_2 and polyoxyethylene (POE) of different molecular mass and different molar ratios of CoCl_2 /POE in the temperature range of 60-115° to check the findings of previous studies and to compare the activity of cobalt in the formation and decomposition of tetraline hydroperoxide in the reactions showed the reaction to proceed through formation of a hydroperoxide catalyst complex with subsequent decomposition into molecular (nearly 95 percent) and radical (nearly 5 percent) products of reaction. References 4; figures 2.
[84-2791]

COMPOSITION OF REACTION PRODUCTS OF CYCLOHEXANE OXIDE WITH METABORIC ACID

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 7 Apr 80)
pp 130-132

SOKOVA, K. M., ZELENAYA, G. A., CHIRKOVA, V. F. and BASHKIROV, A. N.,
USSR Academy of Sciences Institute of Petrochemical Synthesis imeni A. V. Topchiyev

[Abstract] Cyclohexane oxide produced by the reaction of cyclohexane with perbenzoic acid was used in a study of the effect of the magnitude of the molecular mass on the reaction capacity and composition of products of the reaction of oxides of the cyclenes with boron containing compounds. The study showed cyclohexane oxide to have a high reaction capacity to boric acid and its derivatives with the reaction yielding, for the most part, boric acid ethers of high molecular cyclic ether alcohols (93-96 percent) on the converted cyclohexane oxide with 98-100 percent degree of conversion. The reaction of hydrolysis of cyclohexane oxide by water led to formation of trans-cyclohexanediol with a yield of 93 percent.

References 4.

[84-2791]

LIQUID PHASE OXIDATIVE AMMONOLYSIS OF ALKYL BENZENES

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 10 Apr 80)
pp 133-137

SHIK, G. L., CHERNIKOV, V. V., MAGERRAMOVA, R. Yu., SHUKYUROVA, A. M.,
RUVINSKIY, M. E. and SHAKHMAKHTINSKIY, T. N., AzSSR Academy of Sciences
Institute of Theoretical Problems of Chemical Technology

[Abstract] Basic regularities of the reaction of liquid phase oxidative ammonolysis (with omission of aspects of the mechanism and kinetics of the reaction) were discussed with analysis of components of the reaction mixture being conducted by a gas liquid chromatography method. The reaction of liquid phase oxidative ammonolysis of methylbenzenes by gaseous oxygen and ammonia in the presence of cobalt-bromide catalytic systems in medium of aromatic nitrils, aromatic acids and dimethylformamide showed the advantage of conducting the reaction in the presence of aromatic acids which increases the nitril yield up to 78.5 percent, the selectivity of the process up to 91 percent and the specific productivity of the process.

References 6; figures 3.

[84-2791]

CONVERSION OF METHANOL ON THE ZEOLITE 'ULTRASIL'

Moscow NEFTEKHIMIYA in Russian Vol 21, No 1, Jan-Feb 81 (submitted 27 Mar 80)
pp 138-142

LAPIDUS, A. L., MAL'TSEV, V. V., MIRSKIY, Ya. V., BRECHALOVA, N. V. and
MEGED', N. F., USSR Academy of Sciences Institute of Organic Chemistry imeni
N. D. Zelinskiy, Groznyy Scientific Research Institute of Petrochemical Processes

[Abstract] Experiments performed in a flowing system at atmospheric pressure were used to study conversion of methanol on the Na-form of the Soviet zeolite "Ultrasil" with products obtained being analyzed chromatographically with the use of a thermo-conductivity detector. The degree of conversion of methanol under the experimental conditions used (280-400°C, volume velocity 0.2-10.2 hr⁻¹) was 99.6-100 percent. The basic products obtained are a mixture of aliphatic and aromatic hydrocarbons and water. The maximum yield of hydrocarbon of 20-23.5 percent was obtained at 340°C and volume velocity of 0.6-3.1 hr⁻¹. The level of aromatic hydrocarbons in the liquid catalyst increased with the increase of temperature and duration of contact. References 5.

[84-2791]

EFFECTIVENESS OF USING WATER-FUEL EMULSIONS IN MEDIUM-SPEED SHIP DIESELS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 57-59

LEBEDEV, O. N. and NOSOV, V. P.

[Abstract] The effect of water-fuel emulsions on the performance of ship diesel engines was investigated. The jet method of injection was employed, which yielded more uniform distribution of the fuel droplets through the flame and a thinner spray of fuel droplets. Both the maximum soot concentration and soot formation decrease during combustion with addition of water to the fuel. The positive effect of water increases in proportion to the content. The optimum ratio of water to diesel fuel is 15-17 percent, with specific fuel consumption decreasing by 4-7 percent. No traces of corrosion, scale or other salt deposits were found upon disassembly of the engines during operation. Scale formation was less in diesels operating with water injection than those operating on diesel fuel alone. The use of fuel-water emulsions depends on ship power, number of ships operating on the emulsion and other factors with respect to economics. An increase of fuel economy by 3 percent is possible by using a water-diesel fuel mixture.

[87-6521]

OPERATING CHARACTERISTICS OF INTERNAL COMBUSTION ENGINE OPERATING ON WATER-GASOLINE EMULSION

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 56-57

ZAVODOV, V. S., MAZUR, P. F., NOVITSKIY, G. G., SEMENOVA, I. N. and TALISMAN, L. V. Laboratory of Fuel Conservation and Environmental Protection, Ministry of Automotive Transport, RSFSR, attached to Motor Vehicle Column No 1786, Khimki, and Elektrogorsk Branch, All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] An eight-cylinder engine with displacement of 6,000 cm³ and compression of 6.5 was tested with adjustment for water-gasoline emulsions. The engine was tested on a water in gasoline and a gasoline in water emulsion with mass content of 46 and 58 percent water, respectively. The increase of specific fuel consumption with low water ratio begins at excess air factor of 1.07. The engine operates most efficiently with 46 percent water in the gasoline. Internal combustion engines can operate on a water-gasoline emulsion with up to 58 percent water, but with 5-8 percent greater fuel consumption and with 5-8 percent power loss. Figures 2. [87-6521]

UDC 621.43.057:665.521.2

ADDITION OF WATER TO MOTOR FUELS, ONE OF THE DIRECTIONS FOR EXPANDING THEIR RESOURCES AND CONSERVATION

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 53-56

BRATKOV, A. A., AZEV, V. S., RADCHENKO, Ye. D., GLADKIKH, V. A. and LIVSHITS, S. M.

[Abstract] The use of water injection of internal combustion engines with spark ignition was investigated as one of the methods of improving the conservation of fuel and energy resources. The octane numbers of various unleaded and leaded motor vehicle gasolines were determined to analyze the effect of water injection on the detonation stability of the gasolines. The detonation stability of both unleaded and leaded gasolines increases. The octane number of the gasolines increases as a function of the water content in the gasoline mixture, with the highest indicators being a 40-50 percent water to gasoline mixture. The indicated engine power and specific indicator fuel consumption are optimum at ignition advance angles of 30 and 40 degrees without water injection, but the combustion process is optimized with water injection at an advance angle of 50 degrees. The addition of water injection to internal combustion engines permits an improvement of gas economy and conservation of fuel and energy resources. Figures 2; references 6: 3 Russian, 3 Western.

[87-6521]

EXPANDING FUEL RESOURCES FOR SHIP GAS TURBINES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 43-45

SEREGIN, Ye. P., GORENKOV, A. F., BUGAY, V. T., PETROV, V. I. and KLYUYKO, I. G.

[Abstract] The scale-forming properties of fuels differing significantly in composition were investigated on a model ship gas turbine engine. Fuel samples with essentially identical aromatic hydrocarbon content differ in scale-forming properties. Fuel with lower aromatic hydrocarbon content may have scale-forming properties twofold greater than other fuels. Fuels with identical high sootless flame differ by a factor of 1.5-1.7 in the amount of scale. Fuels with identical luminometric number differ 1.2-1.4-fold in the amount of scale. Data were analyzed to determine the best combination of aromatic hydrocarbon content, sootless flame height and luminometric number for producing the least amount of scale in engines. Formulas are derived to take into account the indicated factors. The development of new fuels for ship gas turbine engines can be accelerated by using the mathematical functions along with simplified analysis of the scale-forming properties of present fuels. References: 6 Russian.

[87-6521]

SCIENTIFIC BASES FOR EXPANDING DIESEL FUEL RESOURCES AND CONSERVATION

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, No 80 pp 41-43

SEREGIN, Ye. P., GORENKOV, A. F., BUGAY, V. T. and GUSEV, A. A.

[Abstract] The optimum ratio of the rates of evaporation, ignition and combustion of the fuel-air mixture was studied with respect to the effect on engine efficiency and specific fuel consumption. Formulas were derived to determine the relationship between operating properties such as octane number, rotational frequency and required cetane number. The level of evaporability and combustability must be taken into account as a necessary condition for optimizing fuel quality. The fuel combustability factor is used to predict the results of engine tests. An increase of air temperature leads to an increase of specific fuel consumption by 1.1 percent and to an increase of the exhaust gas temperature by 2.8 percent. Figures 1; references: 7 Russian.

[87-6521]

EXPANDING THE RESOURCES AND CONSERVATION OF FUELS IN GAS TURBINE AVIATION ENGINES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 38-40

GORENKOV, A. F., SEREGIN, Ye. P., KLYUYKO, I. G. and DOMKIN, Ye. I.

[Abstract] Methods of increasing the resources and of conserving jet fuels in aviation engines were evaluated. Various recommendations are given to conserve fuel. Improving the design of engines and of aircraft is also seen as a method of fuel conservation. The possibility of developing liquid hydrogen as an aviation fuel was discussed. Figures 1; references 3: 2 Russian, 1 Western.

[87-6521]

INCREASING THE ECONOMY OF INTERNAL COMBUSTION ENGINES WHEN USING TETRAETHYL LEAD AS AN ANTIKNOCK ADDITIVE

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 37-38

AZEY, V. S., KITSKIY, B. P., LEBEDEV, S. R., MALYKHIN, V. D., GORINA, F. A. and YEMEL'YANOV, V. Ye.

[Abstract] The problems associated with the use of tetraethyl lead and tetramethyl lead and mixtures of them as antiknock agents are discussed. The antiknock effectiveness of tetraethyl and tetramethyl lead was compared under laboratory and highway conditions and the economic and dynamic characteristics of vehicles operating on gasolines with these antiknock agents were evaluated quantitatively. The antiknock value of light and heavy fractions in gasolines containing tetraethyl and tetramethyl lead differs considerably. The difference increases as the concentration of tetraethyl lead in the gasoline increases. The use of tetramethyl lead makes it possible to achieve antiknock operation of an engine with earlier setting of the ignition advance angle than when using gasoline containing tetraethyl lead. Fuel consumption can be reduced by 2.8-4.1 percent if tetraethyl lead is replaced by tetramethyl lead as an antiknock additive. Figures 1; references 2: 1 Russian, 1 Western.

[87-6521]

CONSERVATION OF MOTOR VEHICLE GASOLINES DURING OPERATION OF INTERNAL COMBUSTION ENGINES

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 35-36

NILOV, Yu. N. and ENGLIN, B. A.

[Abstract] The efficacy of increasing the antiknock values of gasolines is discussed with respect to conservation of energy resources. Gasolines containing catalytic cracking products and also nonethylated gasolines containing large amounts of alkylate have the best antiknock properties at low and medium speeds. The need to introduce multifunctional additives to conserve fuel is discussed. It is recommended that detergent additives be added to gasoline every 40,000 to 50,000 miles or after the hydrocarbon content in the exhaust gases increases.

References 5: 4 Russian, 1 Western.

[87-6521]

EXPANSION OF RAW MATERIAL RESOURCES IN GASOLINE PRODUCTION

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 32-34

ENGLIN, B. A., RADCHENKO, Ye. D., YEMEL'YANOV, V. Ye. and LEVINSON, G. I.,
All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] Methyl-ter-butyl ester is discussed as a high-octane component of motor vehicle gasolines. Less energy is required to produce methyl-ter-butyl ester than other high-octane components. The advantages of using methyl-ter-butyl ester and in combination with secondary butanol are compared. More efficient use of petroleum raw material in gasoline production is possible by using these compounds. References 5: 1 Russian, 4 Western.

[87-6521]

COLLECTION AND USE OF USED PETROLEUM PRODUCTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 28-30

BRAY, I. V., URMANCHEYEV, R. A.-Sh. and KEZIN, B. V.

[Abstract] A system for collection and utilization of used petroleum products was developed. The methods used to collect used petroleum products are discussed. Methods of improving the collection of used products and of recovering them for secondary use are listed.

[87-6521]

UDC 622.692.286:622.692.486

CONTROLLING LOSSES OF COMMERCIAL PETROLEUM PRODUCTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 25-27

KHURAMSHIN, T. Z., State Committee for Use of Petroleum Products, RSFSR

[Abstract] The quantitative and qualitative losses of petroleum products and methods of preventing these losses are discussed. Transport and storage or the main types of losses. Evaporation is responsible for up to 75 percent of all losses at petroleum depots. The measures being implemented by various organizations subordinate to the State Committee for Utilization of Petroleum Products, RSFSR, are discussed. Specific recommendations are given to reduce losses at various enterprises.

[87-6521]

UDC 658.26:665.63/64:66.013.6

CONSERVATION OF FUEL AND ENERGY RESOURCES IN THE PETROLEUM REFINING AND PETROCHEMICAL INDUSTRY

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 13-16

YERMOLOV, G. M.

[Abstract] Various methods of reducing energy expenditures in the petroleum refining and petrochemical industry are discussed. Recommendations are given for methods of conserving fuel and energy at industrial enterprises. The measures being implemented at various enterprises are listed.

[87-6521]

CONSERVATION OF PETROLEUM PRODUCTS IN THE NATIONAL ECONOMY OF THE RSFSR

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 80 pp 10-12

KHURAMSHIN, T. Z., State Committee for Use of Petroleum Products, RSFSR

[Abstract] Methods of efficient and economic consumption of fuel and energy resources are discussed. Increased efficiency of using liquid fuels is determined by the degree of utilization in operation of equipment, by reducing the energy consumption of production processes, by improving normalization and accounting and reception and storage operations and on allocation of fuels at petroleum supply and user bases and warehouses. A continuing struggle is waged against losses of petroleum products during operation of equipment and also during transport, storage and distribution. Various types of penalty sanctions against users who violate the decree on proper use of petroleum products are discussed. Various methods of preventing the misuse of petroleum products such as selling on the black market are proposed. Recommendations are given to further increase the efficiency of utilizing petroleum products.

[87-6521]

UDC 665.7.038:[665.767:621.9]

NEW BACTERIOCIDAL ADDITIVES TO CUTTING FLUIDS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 81 pp 46-47

KACHAN, V. I., LEBEDEV, Ye. V., ALPAT'YEVA, T. A. and GRIGOR'YEVA, G. G.,
VNIIPKneftekhim

[Abstract] Investigations were conducted to find and approve antimicrobial preparations that correspond to requirements on bacteriocidal additives for cutting fluids. Addition of the bacteriocidal additives to the cutting fluids significantly increases the service life of the fluids. The domestic additive vasin was compared to various foreign bacteriocidals. Vasin, along with Formacide-13 and Nitroside-2 are recommended for large-scale production. References 8: 4 Russian, 4 Western.

[88-6521]

ESTERIFICATION OF SYNTHETIC FATTY ACIDS OF C₅-C₉ FRACTION BY POLYOLS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 81 pp 34-36

KHUDAYBERGANOV, A. K., SULTANOV, A. S., YUNUSOV, M. P., KUKOVITSKIY, M. M. and SIZOV, N. I., Central Asian Scientific Research Institute of the Petroleum Industry

[Abstract] Esterification of synthetic fatty acids of C₅-C₉ fraction by polyols was investigated in a flow of nitrogen carbORIZED vapors of an azeotrope-forming solvent. Cyclohexanone, chlorobenzene and ethylcarbonate produce the best results when used as an azeotrope-forming solvent. The rate of the reaction is largely dependent on the water content in the azeotrope vapors during esterification using various solvents. The acid number of the mixture decreases and the yield of esters increases as temperature increases. The ester produced by azeotropic distillation of equilibrium water and the lubricating composite based on it have increased thermooxidation stability compared to the industrial ester. Figures 1;

references: 7 Russian.

[88-6521]

UDC 665.654.2:54-44:546.16

PRODUCTION OF LOW-CONGEALING DIESEL FUEL USING A MODIFIED REFORMING CATALYST

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 81 pp 29-31

SARIYEV, I., SOKUROV, A. and PENCHEV, V., Institute of Petroleum Refining and Petrochemistry, Peoples Republic of Bulgaria

[Abstract] Bifunctional catalysts of hydrofluoric acid were studied to expand the range of application of the catalysts. AP-56 industrial reforming catalyst was selected as the initial catalyst and its activity after modification was evaluated during light hydrocracking of the diesel fraction. Diesel fuel with congealing temperature of -22 to 25°C was produced on a modified reforming catalyst. Both the catalysts of the same fractional composition and the initial raw material vary significantly after distillation of the light fractions. The content of paraffin hydrocarbons increases mainly due to naphthenes, indicating that hydrocracking attracts both lateral chains and naphthene nuclei. Fluorination of the industrial reforming catalyst makes it possible to affect the chemical composition of complex hydrocarbon mixtures and to produce diesel fuels with improved low-temperature properties. References: 4 Russian.

[88-6521]

OPTIMUM TEMPERATURE CONDITIONS IN CATALYTIC REFORMING REACTORS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 81 pp 26-28

SKIPIN, Yu. A., FEDOROV, A. P., MASLYANSKIY, G. N. and SHKURATOVA, Ye. A.,
Scientific Production Association Lenneftekhim

[Abstract] The optimum temperature distribution at the input into the reactor block under conditions that simulate the operation of industrial catalytic reforming installations was studied. Three prolonged runs of the installation were carried out at reduced, even and elevated temperatures at the input to the reactors. The yields of stable catalyzate and of aromatic hydrocarbons were essentially identical. There were no appreciable differences in the relative content of paraffin hydrocarbons of iso and normal structure in the liquid products under various temperature regimes. The temperature distribution at the reactor input has little effect on the selectivity of the process. The mean quantity of deposited coke increases from reactor to reactor. The interregeneration cycle is enhanced if the temperature conditions are more rigid in the first reactors than in the last reactor.

Figures 3; references 8: 7 Russian, 1 Western.

[88-6521]

UDC 665.644.26

DEVELOPMENT OF HYDRO CRACKING OF LIGHT CATALYTIC CRACKING GAS OIL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 81, pp 23-25

KHAVKIN, V. A., KOZLOV, I. T. and AGAFONOV, A. V.,
All-Union Scientific Research Institute of the Petroleum Industry

[Abstract] Investigations were carried out on a high-pressure laboratory hydrogenation installation to develop a process of hydro cracking of light catalytic gas oil. The gasoline produced from cracking corresponded to all requirements of the standard for A-76 motor vehicle gasoline and for AI-93 ethylated gasoline. Hydro cracking of light catalytic cracking gas oils can be carried out at reduced pressure to produce high-octane motor vehicle gasolines. Figures 1; references 5: 1 Russian, 4 Western.

[88-6521]

INVESTIGATION OF THE POSSIBILITY OF MODIFYING POLYCAPROAMIDE FIBERS BY ADDING
POLYOXYMETHYLENE ADMIXTURES

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 5. Sep-Oct 80 pp 35-37
manuscript received 10 Apr 80

TSEBRENKO, M. V., REZANOVA, N. M., VISLENKO, V. I. and YUDIN, A. V.,
Kiev Technological Institute of Light Industry

[Abstract] The results are given of a study of the possibility of producing polycaproamide fibers having at the same time an improved initial elastic modulus and strength, by reinforcing the polycaproamide with ultrafine polyoxymethylene microfibers and using a relatively small amount of polyoxymethylene. The polymers were mixed by using an extruder. Studies were made of composites with polyoxymethylene content of 2, 5, 10, 20, 70, 80 and 90 percent. The viscosity properties of melts of PKA [polycaproamide] - POM [polyoxymethylene] mixtures were studied with an MV-2 microviscosimeter at 240 and 260°C in an atmosphere of nitrogen for the purpose of evaluating the influence of admixtures of POM on the fiber-forming properties of a PKA melt. The PKA used had a relative viscosity of 2.6 for a one-percent solution in concentrated sulfuric acid and had a 0.8-percent low-molecular content. The POM used was in the form of a copolymer of trioxane and two-percent 1,3-dioxane with a characteristic viscosity of 0.49 for a 0.5 percent solution in dimethyl formamide at 150°C. The POM also contained a stabilizing composition consisting of 0.5 percent by weight of NG-2246 antioxidant and 0.5 percent by weight of a formaldehyde-dicyandiamide acceptor. The POM had these properties in order to eliminate its destruction in the process of forming fibers. Spinning was performed with a UFTP-2 experimental industrial machine of the extruder type at 260°C with a 4000-percent die draft. The spun fibers were then drawn at 140°C at a rate of 115 m/min. The PKA polymer matrix was etched with m-cresol at 20°C in order to separate the disperse phase, and the POM matrix was etched with hot dimethyl formamide in a Soxhlet apparatus for the same purpose. The results demonstrate that fibers with a POM content of two to 20 percent by weight are characterized not only by an improved elastic modulus, but also by improved strength, whereby the optimal amount of POM added is five to 10 percent by weight. The existence of ultrafine polyoxymethylene fibers in a PKA mass exerts a reinforcing effect on polycaproamide

fibers, as demonstrated by the experimental data for PKA:POM compositions of 98:2, 95:5, 90:10 and 80:20. PKA does not form microfibers in a POM matrix. In the drawing process POM forms ultrafine fibers in the PKA matrix which are oriented in the direction of straining in the drawing process. Figures 2; references 7: 6 Russian, 1 Western.
[23-8831]

UDC 547.794:543.422

REACTION OF 2-ACETYL-3-METHOXY-5-METHYLDIAZAPHOSPHOLINE WITH PHENYLAZIDE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 255, No 5, 1980 pp 1117-1120
manuscript received 2 Jun 80

ARBUZOV, B. A., academician, and DIANOVA, E. N., Kazan' State University
imeni V. I. Ul'yanov-Lenin Chemical Institute imeni A. M. Butlerov

[Abstract] The results are given of a study of the reaction of phenylazide with 2-acetyl-3-methoxy-5-methyldiazaphospholine. This reaction occurs at room temperature in a solution of ether with the separation of nitrogen and the formation of a colorless powder with a melting point of 70 to 80°C. This powder is not the expected monomeric iminodiazaphospholine (IV), but its dimer with the diazadiphosphoethidine ring (V). A determination of the molecular weight of V in bromoform by the cryoscopy method demonstrated that in a freshly prepared solution this product is 80 percent in the dimer state, but as the solution stands the dimer gradually becomes a monomer. In solution, as well as in sublimation under high vacuum at 150°C and a pressure of $5 \cdot 10^{-2}$ mm Hg, dimer V is converted to iminodiazaphospholine (IV), which is thermodynamically unstable and by the transfer of a proton to the imine nitrogen becomes aminodiazaphospholine (VI). CH_3CN , C_6H_6 and $\text{C}_2\text{H}_5\text{O}_5$ favor the formation of VI. In freshly prepared solutions of CH_2Cl_2 and CHBr_3 all three forms, IV, V and VI, are contained. When a solution of CH_2Cl_2 has stood for 2 h the content of IV is drastically reduced and that of V increases, and after 42 days IV disappears completely and the content of VI increases. Therefore, interconversion takes place: $\text{V} \rightleftharpoons \text{IV} \rightleftharpoons \text{VI}$. Results were obtained which give evidence of possible tautomeric equilibrium, $\text{IV} \rightleftharpoons \text{VI}$. A crystalline product with a melting point of 49 to 50°C was produced by dissolving dimer V in alcohol and then separating it under vacuum, as well as by the sublimation of V under high vacuum. The IR spectrum of this product in vaseline oil demonstrates that it is a mixture of IV and VI. The ^1H NMR spectrum of this product in CCl_4 demonstrates that forms IV and VI are also present in CCl_4 in a ratio of 1:2. In the solid state and in a CCl_4 solution this crystalline product is a mixture of forms IV and VI, but in CH_2Cl_2 , CH_3CN , C_6H_6 , $\text{C}_2\text{H}_5\text{OH}$ and CH_3OH the complete conversion of IV to VI takes place.

However, when these solvents are removed and the product is separated as a solid a mixture of IV and VI is again observed when the product's ^1H NMR spectrum is recorded in CCl_4 . Figures 2; references 5: 3 Russian, 2 Western.
[41-8831]

UDC 547.424.22+547.473.2

PRODUCTION OF γ -BUTYROLACTONE BASED ON BUTENE-2-DIOL-1,4

Moscow NEFTEK .MIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 858-863
manuscript received 18 Oct 79

OVCHINNIKOVA, T. F., KRYUKOV, S. I., SIMANOV, N. A. and FARBEROV, M. I.,
Yaroslavl' Polytechnical Institute

[Abstract] Hydration of butene-2-diol-1,4 in butanediol-1,4 and production of γ -butyrolactone by dehydration of butanediol-1,4 and hydrocyclization of butene-2-diol-1,4 were investigated. Aluminum oxide-based palladium, chromium oxide-based nickel, diatomaceous earth-based nickel and Reney's nickel were used as the catalysts for hydration of butene-2-diol-1,4. The yield of γ -butyrolactone comprises 74-75 molar percent with complete conversion of the initial butenediol. Tetrahydrofuran and n-butylalcohol were byproducts of the reaction. Figures 3; references: 8 Russian.
[52-6521]

UDC 678.019.38

BIOSTABILITY OF PLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 81 pp 19-21

TUL'CHINSKAYA, V. P., MISHNAYEVSKIY, M. S. and YURGELAYTIS, N. G.

[Abstract] The irreversible change of the properties of plastics during prolonged storage and operation caused by the aging process was studied. Various types of biological damage by microorganisms such as fungi, bacteria, actinomycetes and so on were investigated. Microorganisms do not cause degradation of the polymer molecule but do cause hydrolysis of the polymer and assimilate a low-molecular product. Plastics based on epoxide, diallylphthalate and polyurethane resins containing inorganic fillers are less affected by fungi. Increased temperatures also increase degradation by fungi. The composition and properties of the material, the manufacturing technique and operating conditions largely determine the biological

stability of plastics and articles made from them. The biological stability of the material decreases as the number of components in the composite increases. Various types of antiseptics are used to protect plastics against microorganisms. Volatile substances are used to provide temporary protection of the material. Various types of chemical compounds and organic tin and metal compounds were investigated as biocidal preparations. References 49: 39 Russian, 10 Western. [89-6521]

UDC 678.686]01:541.11

THERMOSTABILITY OF EPOXIDE COATINGS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 81 p 28
manuscript received 10 Jul 79

LOMOV, Yu. M., VOLOSHKIN, A. F. and SHOLOGON, O. I.

[Abstract] The effect of the structure of oligomers, their molecular mass and the type and quantity of hardening agent on the thermostability of epoxide polymers was studied using various anhydrides and carbonic acids as hardening agents. The breakdown temperature of epoxide polymers decreases as the content of hardening agent increases. The mechanism of the breakdown of epoxide polymer was studied by infrared spectroscopy. The impurities present in the initial oligomer can affect the breakdown of the process. The presence of volatile substances and chlorine and sodium ions in the initial epoxide oligomer results in a decrease of its thermostability. The type of anhydride and its content also affects the thermostability of the polymers. Figures 2; references 7: 5 Russian, 2 Western. [89-6521]

UDC 678.4.031.002.612

COLLOIDAL-CHEMICAL AND TECHNOLOGICAL PROPERTIES OF MIXTURES OF NATURAL LATEX
AND A SYNTHETIC AQUEOUS DISPERSION OF CIS-1,4 POLYISOPRENE

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 10-13 manuscript received
4 Apr 80

GRUBMAN, Yu. V., EL'KINA, I. A., LYASHENKO, O. A. and CHERNAYA, V. V.,
Scientific Research Institute of Rubber and Latex Products and Voronezh University

[Abstract] The colloidal-chemical and technological properties of mixtures of DSKI-3 (cis-1,4 polypropylene) with natural latex and the properties of the vulcanized rubber produced were studied. The rate of ion deposition increases as the natural latex content in the mixture is increased and when the components are mixed 50:50 the rate of ion deposition exceeds the rate of polymer deposition of natural latex. Syneresis is slowed considerably and the drying process of gels is accelerated if the natural latex content in the mixture is increased. The time of optimum vulcanization of the mixtures is sharply reduced as the natural latex content is increased. The strength properties of gels and vulcanized rubber are enhanced considerably when the natural latex content in the mixture is increased. Introduction of natural latex to the DSKI-3 dispersion considerably improves its technological properties and the strength characteristics of vulcanized rubber. Figures 4; references 8: 7 Russian, 1 Western.
[49-6521]

CAUSES OF VARIATION OF THE EFFICIENCY OF p-NITROSODIPHENYLAMINE AND STABILIZERS OF THE p-PHENYLDIAMINE CLASS IN FILLED SKI-3 RUBBER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 13-19
manuscript received 21 Apr 80

ROKAREVA, M. Yu., ALEKSEYEVA, I. K., KAVUN, S. M. and LYKIN, A. S.,
Scientific Research Institute of the Tire Industry

[Abstract] A series of experiments was set up to check the hypothesis that the detected antagonism of the antioxidant and of p-nitrosodiphenylamine in rubber tire mixtures is determined by competition of the processes of adsorption of modified fragments of rubber macromolecules and the antioxidant on active centers of the commercial carbon surface. The specific adsorption of p-phenolenediamine structures on active centers of the commercial structure is characterized by irreversible chemisorption and reversible physical adsorption. The reason for the decrease in efficiency of the modifying action of p-nitrosodiphenylamine in rubber mixtures based on SKI-3 in the presence of p-phenolenediamine stabilizers is competition of the processes of adsorption of low-molecular p-phenolenediamine structures and those grafted to the rubber on active centers of the filler surface. The absence of a stabilizing effect of p-nitrodiphenylamine in filled rubber at the rate of 0.3-0.5 mass hours is caused by irreversible adsorption of modified links of the rubber macromolecules on the surface of commercial carbon. Figures 4; references 16: 12 Russian, 4 Western.
[49-6521]

UDC 678.4.063.01:539.24

DETERMINING THE DENSITY OF THE VULCANIZATION NETWORK IN RUBBER MADE FROM COMBINATIONS OF SKI-3 AND SKMS-30 ARK RUBBER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 19-22
manuscript received 10 Dec 79

SHVYDKAYA, N. P., SHUMANOV, L. A., SEMENOVA, L. P. and LYKIN, A. S.,
scientific Research Institute of the Tire Industry

[Abstract] The degree of cross-linking of each of the rubbers in rubber made from a combination of SKI-3 and SKMS-30 ARK was determined with ratios of 20:80, 40:60, 60:40 and 80:20 respectively. The ratio of rubber in the mixture and the level of dispersion of the rubber phases achieved upon mixing have no effect on the chemical yield of cross-linking and breakdown in them. The processes of cross-linking and

breakdown in them. The processes of cross-linking and breakdown in the elastomer phases proceed independently of each other. As a result the degree of equilibrium swelling of vulcanized rubbers made from SKI-3 and SKMS-30 ARK and the corresponding elastomer phases in the vulcanized rubber made from a combination of these rubbers is equal. Figures 4; references 7: 5 Russian, 2 Western.
[49-6521]

UDC 678.743.47.028:541.124

ROLE OF CALCIUM HYDROXIDE IN BISPHENOL VULCANIZATION OF SKF-26 RUBBER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 22-24
manuscript received 19 Oct 79

LAVROVA, L. N., NUDEL'MAN, Z. N., DONTSOV, A. A. and LANINA, Ye. V.,
Scientific Research Institute of the Rubber Industry

[Abstract] The mechanism of interaction of biphenols hydroquinone, resorcin and pyrocatechol with components of a rubber mixture during vulcanization and the effect of the bisphenol structure on the kinetics of vulcanization were studied to determine the role of calcium hydroxide in bisphenol vulcanization of SKF-26. The pyrocatechol is extracted from the mixture to a lesser extent than hydroquinone and resorcin. The process of vulcanization of a rubber mixture with 6.0 parts by mass of calcium hydroxide slows down sharply when the hydroquinone content is increased to 1.6 parts by mass. Vulcanization is restored if the calcium hydroxide content in the mixture is doubled. The rate of vulcanization with addition of pyrocatechol decreases only slightly upon interaction of ion pairs with the polymer whereas the rate of vulcanization decreases by more than a factor of 20 if 1.6 parts by mass of hydroquinone is added. Diatomic phenols which do not form intramolecular hydrogen bonds must be used for vulcanization of SKF-26. Figures 2; references 8: 4 Russian, 4 Western.
[49-6521]

INVESTIGATING THERMOVULCANIZATION OF POLYCHLOROPRENE BY THE DIELECTRIC METHOD

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 28-29

manuscript received 11 Oct 77

BAGDASARYAN, E. I., ARUTYUNYAN, L. S., ZAKHAROV, N. D. and KABALYAN, Yu. K.,
Scientific Production Association "Nairit"

[Abstract] The process of thermovulcanization of chloroprene homopolymer (nairit P) used extensively in the industrial rubber products and cable industry was investigated. The polychloroprene was produced by emulsion polymerization using mercaptan as a regulator and NG-2246 product as a stabilizer. Macromolecules are oxidized, structuring occurs due to allyl chlorine, the macromolecules break down, high-molecular fragments are formed and intramolecular structuring of high-molecular oxidized fragments occurs during thermovulcanization of polychloroprene by the dielectric method. Figures 4; references: 8 Russian.

[49-6521]

EFFECT OF ULTRAVIOLET RADIATION INTENSITY ON THE RATE OF CREEP OF AN ELASTOMER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 30-32

manuscript received 9 Jul 79

ALEKSANDROVA, A. K., STEPANOV, V. F. and VAYSBERG, S. E.,
Scientific Research Physicochemical Institute imeni L. Ya. Karpov

[Abstract] The effect of ultraviolet radiation intensity on the rate of creep of unfilled SKI-3 rubber, films of which essentially absorb ultraviolet radiation completely in the range of 230-400 nm with thickness of 80-50 microns. The dependence of the initial rate of photocreep of rubber on the intensity of the dosage is described by a convex, sublinear curve proceeding from the origin rather than a linear curve. The dependence of the rate of photocreep on the intensity of radiation is the same as in the case of ionizing radiation. There are common mechanisms for creep of the given type of rubber in different radiation fields. Figures 4; references: 4 Russian.

[49-6521]

INCREASING THE INTENSIFYING EFFECT OF SLAG ASH CARBON FILLER IN RUBBER

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 36-38
manuscript received 28 Mar 79

PASTOR, T. I., DEVIKINA, L. I. and KRASOVSKIY, V. N.,
Leningrad Branch of Scientific Research Institute of the Rubber Industry and
Leningrad Technological Institute imeni Lensovet

[Abstract] The effect of treating a slag surface with a surfactant on its intensifying properties was studied to determine whether interaction of the polymer and mineral filler surface is improved upon hydrofobization. The surfactants were introduced both during manufacture of a rubber mixture on rollers and by preliminary treatment of the filler. The greatest effect of rubber strengthening is achieved when a pretreated filler is used. No effect of rubber strengthening is observed when the slag-ash filler is treated with cation-active surfactant and the strength indicators do not vary over the entire range of surfactant concentrations. Anion-active surfactants are strongly chemisorbed on the surfaces of basic compounds. The strength indicators of rubber can be improved by preliminary treatment of the surface of a slag-ash carbon product with anion-active surfactants introduced at the rate of 0.4-0.6 percent by mass. Figures 2; references 12: 11 Russian, 1 Polish. [49-6521]

FIRE-HAZARD AND TOXIC PROPERTIES OF INGREDIENTS

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 p 54

[Abstract] The fire-hazard and toxic properties of "alrafor" resin and triethanolamine were studied. Alrafor has a flash point of 188°C and is toxic in minimum doses of 6 mg/m³. The compound can be extinguished with chemical and air-mechanical foam and with a fine water spray. Triethanolamine has a flash point of 179°C and self-combustion point of 395°C. The maximum permissible concentration is 5 mg/m³. Combustion of triethanolamine can be extinguished by chemical and air-mechanical foam and by a fine water spray. Both compounds require flow-through exhaust ventilation of buildings, special clothing, protective glasses and protective respirators. [49-6521]

POLYBUTADIENE URETHANE MATERIALS FOR WEAR-RESISTANT COATINGS AND HERMETIC PRODUCTS

Moscow KAUCHUK I REZINA in Russian No 11, Nov 80 pp 7-10
manuscript received 19 Dec 79

SHITOV, V. S., LABUTIN, A. L. and MATVEYEV, G. V., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] The effect of various factors on the physicochemical and operational properties of polybutadiene urethane coatings and hermetic products was studied. The physicochemical indicators of coatings and hermetic products were determined according to the appropriate state standards. SKU-DF-2 and SKU-DF-3 urethane four polymers produced by interaction of oligobutadienediol and toluene diisocyanate in molar ratio of 1:2 and 1:3 and vulcanizing agents 3,3'-dichloro-4,4'-diaminodiphenylmethane, 3,3-dichloro-4,4'-diaminotriphenylmethane and their equimolecular eutectic mixture were selected as the objects of investigation. Among the three investigated diamines, diamet X(3,3'-dichloro-4,4'-diaminodiphenylmethane) had the highest activity, while 3,3'-dichloro-4,4'-diaminotriphenylmethane had the lowest activity. The polybutadiene urethane coatings and hermetic products have high hydrolytic stability due to the carbon chain structure of the main polymer chain. The strength of films made from rubberized and sealing compositions of polybutadiene urethane essentially do not vary after aging in sea water for 1,000 hours. Polybutadiene urethane coatings are recommended for protecting chemical equipment against corrosion while the hermetic products are recommended for repair of rubber linings due to their high chemical stability. Figures 5;

references: 6 Russian.

[49-6521]

UDC 541.(64+127):539.3

INFLUENCE OF STATIC STRAINS OF KINETICS OF THE OXIDATION OF VULCANIZED RUBBER FROM POLYISOPRENE CONTAINING SULFUR BONDS

Moscow VYSOKOMOLEKULARNYE SOYEDINENIYA in Russian No 11, Oct 80 pp 2604-2608
manuscript received 28 Dec 79

BOL'SHAKOVA, S. I., KUZ'MINSKIY, A. S. and KORNIYENKO, I. V.,
Scientific Research Institute of the Rubber Industry

[Abstract] In studies of the influence of mechanical strains on the oxidation rate of polymers have been observed both the mechanical activation of the oxidation process and the retardation of oxidative transformations resulting from reduction

of the conformational mobility of the matrix. No estimate has as yet been made of the relative role of the factors of the straining and stressing of chemical bonds which simultaneously influence chemical processes in a strained polymer. A study is made here to differentiate the influence of mechanical stresses and strains on these chemical reactions. A comparative study was made of the kinetics of the oxidation of vulcanized rubber produced only by means of dicumyl peroxide (DKP) and with the combined use of DKP and sulfur. Small quantities of sulfur added to raw rubber in peroxide vulcanizing have a protective effect. Vulcanized rubber of this kind exhibits improved thermo-oxidative stability when used for rubber seals which work under stress at high temperatures. A DAK-1-1 microcalorimeter was used to obtain information on oxidation kinetics by analyzing thermal effects accompanying chemical reactions. An ROR-2 model 2029 axial tension relaxometer was used to determine the relaxation of stressed bonds under static tensile straining of vulcanized rubber. Polyisoprene in the form of natural raw rubber of the "white crepe" type was vulcanized by means of DKP in an amount of 1.2 percent by weight and also by means of the same quantity of DKP with 0.3 percent by weight of sulfur added. The time for the process at a given temperature equaled the time for complete consumption of the vulcanizing agents and byproducts of the reaction were removed by evacuation of the samples at 150°C. The vulcanized rubber samples studied were in the form of films 200 microns thick containing an identical number of intermolecular bonds. The procedure for oxidizing vulcanized rubber in the statically strained state is described in an earlier study (1979). The data obtained show that the influence of static strains is evidenced differently at different stages of oxidation. At the first stage of the process sulfides are oxidized and this reaction is accelerated considerably by the effect of stresses originating under static straining. At the autocatalysis stage static strains inhibit oxidation by reducing the rate constant and increasing the energy for activation of this process by reducing the conformational mobility of macromolecules. Two simultaneously developing processes characterize the kinetics of heat release in the oxidation of raw rubber: heat release having a rate constant equal to the rate at the initial moment of time, providing information on the oxidation rate in the absence of branching reactions, and heat release consistent with the autocatalytic development of oxidation, where the autocatalysis rate constant equals the difference of the rate constants for branching and breaking of the chain. This heat release pattern is observed in thermal oxidation of rubber vulcanized by means of DKP alone, but the kinetic heat release curve for the rubber vulcanized with the addition of sulfur displays two sections, the first of which has a diminishing rate of heat release, and the second an increasing rate. The rate in the first section is reduced to a value representing the starting rate for autocatalytic oxidation developing in the second section. Heat release kinetics in the second section are similar to those observed for the rubber vulcanized without sulfur. Figures 3; references 12: 10 Russian, 2 Western.

[18-8831]

EFFECT OF THICKENING AGENTS ON THE PROPERTIES OF FOOD-GRADE LATEXES

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 81 pp 17-18
manuscript received 11 May 79

DONTSOVA, E. P., BELYAYEVA, T. A., BELAVKINA, N. S. and GUL', V. Ye.

[Abstract] The effect of thickening agents on the colloidal-chemical properties of food-grade latexes based on vinylidene chloride copolymers and films made from them were studied. The viscosity of the latex increased as the content of thickening agents increased. The increase was a function of the degree of the adsorption saturation of latex globules by a surfactant. Films made from composites containing slight amounts of sodium alginate, polyvinyl alcohol and the sodium salt of carboxymethyl cellulose were very brittle and unsuitable for physicomechanical tests. Viscosity decreased as a function of the shear stress of latex. Vinylidene chloride and vinyl chloride copolymer latexes with adsorption saturation of latex globules of 30 percent or more are best thickened by butyl acrylate and acrylic acid, while these latexes with 100 percent adsorption saturation of latex globules are best thickened by methyloxypopyl cellulose. Figures 2; references 7:

6 Russian, 1 Western.

[89-6521]

CSO: 1841

- END -

END OF

FICHE

DATE FILMED

July 10, 1981